AGRICULTURAL ENGINEERING

The Journal of the American Society of Agricultural Engineers

MAY 1935

Present Day Demands Influencing Farm Building Design - - - - - - - - *J. C. Wooley*

The Use of Colored Light in Electrocuting Traps for Control of the Grape Leafhopper - - - - - - - - *Hermes and Ellsworth*

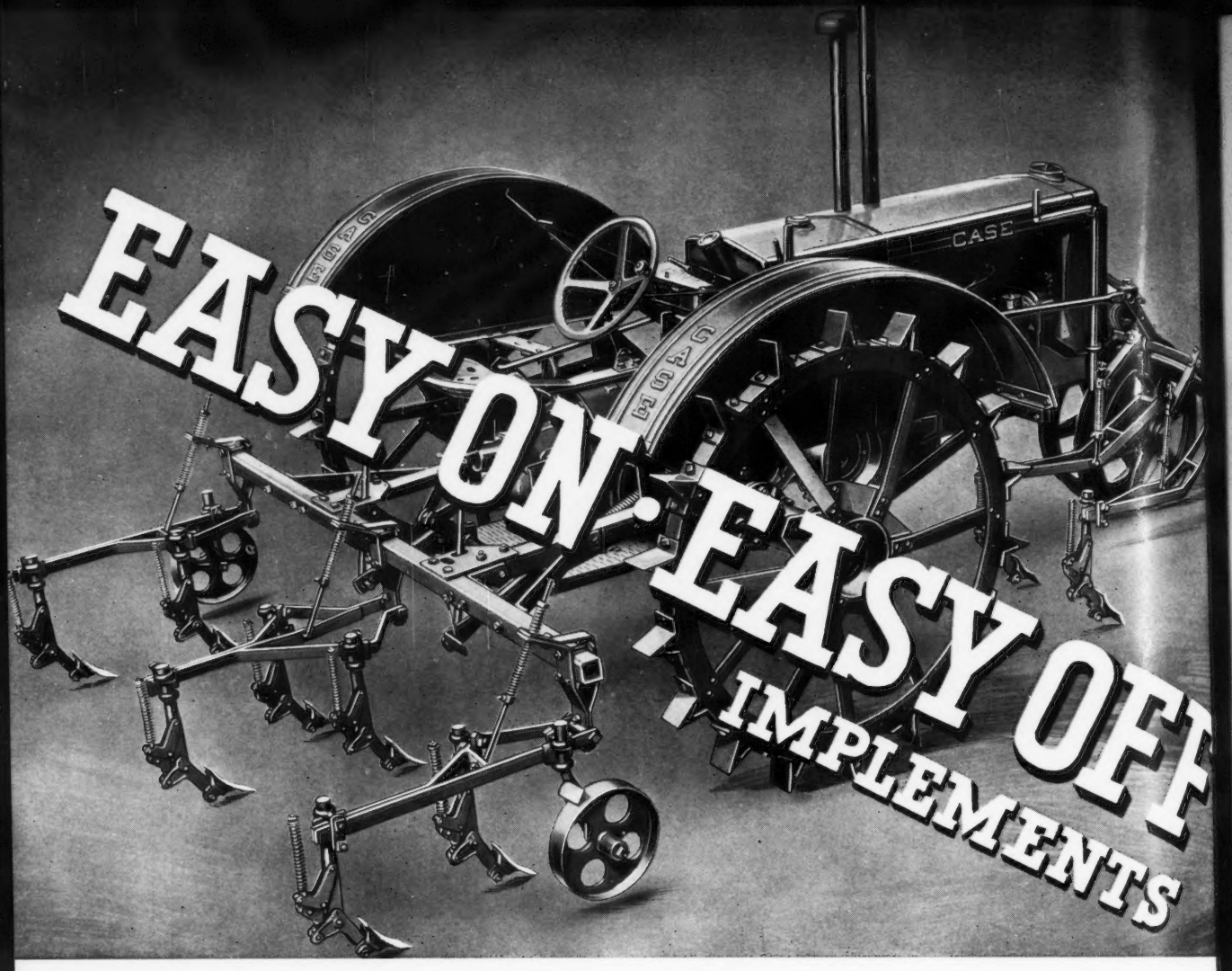
Soil Erosion Control in the Pacific Northwest - - - - - - - - - - - - *P. C. McGrew*

Teaching Terracing with Combinations of Wooden Blocks - - - - - - - - - - *D. Scoates*

Rates of Flow from Porous Canvas Irrigation Hose - - - - - - - - - - - - - *F. E. Staebner*

VOL 16 NO 5

A. S. A. E. Annual Meeting . . . Athens, Georgia, June 17 to 20, 1935



★ Just as the Case Motor-Lift for 1935 brings to row crop farmers step-on-a-pedal control of planter, cultivator and other tools, so the new line of implements are not only quicker to mount but also easier to operate and adjust.

These new implements are unit built and can be put on or taken off in a few minutes. There are but few and simple connections. Yet each implement is solidly bolted to the tractor and quickly and easily controlled for better work. Still another feature is the great strength without bulky weight built into these machines through generous use of steel parts and forgings.

This new equipment is fully described and illustrated in a new catalog, a copy of which will be gladly sent to agricultural engineers and others upon request.

J. I. CASE COMPANY - RACINE, WISCONSIN

CASE

77 MODERN FARM MACHINES

AGRICULTURAL ENGINEERING

Published by the AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

VOLUME 16 | MAY 1935 | NUMBER 5

CONTENTS

EDITORIALS 179

SOME PRESENT DAY DEMANDS INFLUENCING FARM BUILDING DESIGN 181
By J. C. Wooley

THE USE OF COLORED LIGHT IN ELECTROCUTING TRAPS FOR THE CONTROL OF THE GRAPE LEAFHOPPER 183
By W. B. Herms and Joe K. Ellsworth

ENGINEERING EXPERIMENTS IN SOIL EROSION CONTROL IN THE PACIFIC NORTHWEST 187
By P. C. McGrew

TEACHING TERRACING WITH BLOCKS 190
By D. Scoates

VISUALIZING SOIL EROSION CONTROL 191
By M. F. Thurmond

A MONOLITHIC CONCRETE POTATO WAREHOUSE 193
By M. B. Jensen and F. A. Lyman

RATES OF FLOW FROM POROUS CANVAS HOSE 193
By F. E. Staebner

SOIL EROSION CONTROL WORK BY THE CCC 194
By H. J. Stockwell

THEO. BROWN AWARDED McCORMICK MEDAL 195

ASAE ANNUAL MEETING PROGRAM 196

NEWS 198

STUDENT ACTIVITIES 200

AGRICULTURAL ENGINEERING DIGEST 202

OFFICERS OF THE SOCIETY: G. W. McCUEN, *President* RAYMOND OLNEY, *Secretary-Treasurer*

PUBLICATION COMMITTEE: H. B. WALKER, *Chairman* F. A. LYMAN A. P. YERKES
R. U. BLASINGAME C. F. MILLER

Published monthly by the American Society of Agricultural Engineers. Publication office at Benton Harbor, Michigan. Editorial and advertising departments at the headquarters of the Society, St. Joseph, Michigan . . . . Price $3.00 a year, 30 cents a copy; to members $2.00 a year, 20 cents a copy. Postage to countries to which second-class rates do not apply, $1.00 additional . . . . The Society is not responsible for statements and opinions contained in papers published in this journal; they represent the views of the individuals to whom they are credited and are not binding on the Society as a whole . . . . Entered as second-class matter, October 28, 1933, at the post office at Benton Harbor, Michigan, under the Act of August 24, 1912. Additional entry at St. Joseph, Michigan. Acceptance for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 11, 1921 . . . .
The title AGRICULTURAL ENGINEERING is registered in U. S. Patent Office. Copyright, 1935, by American Society of Agricultural Engineers.

In Allis Chalmers Tractors Hyatt Roller Bearings are used in the transmission, on the belt pulley and power take-off.

Heavy going of day in and out operation demonstrates the necessity of bearings that are correctly built and soundly engineered for the application.

Hyatt Roller Bearings measure up to this assignment and ask no special favors of time or attention. They have in their make-up the stuff it takes to withstand the rigors of shocks and strains — endurance to shoulder heavy loads under extreme conditions—inbuilt stamina for hard service over long stretches.

Thus, thousands of machine and equipment builders have learned to rely upon the experience and facilities of the Hyatt factory and field forces as their source of supply for bearings of unfailing dependability. Hyatt Roller Bearing Company, Newark, Detroit, Chicago, Pittsburgh, Oakland.

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

AGRICULTURAL ENGINEERING

VOL 16, NO 5 EDITORIALS MAY 1935

Manufactured Farm Buildings

THOUGHTFUL reading of the article by Professor J. C. Wooley, appearing in this issue, affords added emphasis on the essential unity of agricultural engineering. Necessary as our technical divisions may be for practical allocation of agenda, they should not be permitted to separate our work into isolated and poorly articulated fragments. In particular we need more correlation between the structures and machinery groups.

It may be natural enough for the machinery engineer, whose products are designed for a decade, to regard as fixed and unchanging the buildings that have stood for half a century and promise to persist as long again. It may be equally as natural for the structures man to feel that he should not be much influenced by anything so ephemeral as current machinery practice. If such viewpoints prevail there will be no vigorous, visionary junking of old ideas and unified attack on the problem of fully correlated buildings and machinery to bring striking efficiencies in the overall pattern of farming.

It probably is significant that moves to end this stalemate are being made by commercial interests producing what we may call manufactured farm buildings. An example is the hay storage unit which definitely involves hay-chopping and elevating machinery, and an equally definite system of hay-making. Though commercially active only in the structures field, these interests have dared to invade the zones of machinery and management to arrive at overall efficiency.

Manufactured farm buildings promise other important advantages, both economic and psychological. It is axiomatic that production reaches its highest efficiency when concentrated in the factory, and is most inefficient when performed on the premises of the consumer. Suppose, for example, that to get an automobile it were necessary to begin with blueprints and bills of material; to buy sheets here, channels there, bolts and bearings somewhere else; then hire workmen to come on the premises, whittle out the parts with hand tools, and eventually assemble a vehicle. The automobile industry would be just about as active as are the building trades.

The building trades and materials industries should, by this time, be pretty well convinced of the futility of justifying costs instead of reducing them. Profitable markets are created by making the product more, not less, economic to the consumer. In the structures field, no other equals the farm market in the volume of building needed, in the degree to which standardization is feasible, and in adaptability, as to type and size, of the units to factory manufacture. In no other large market is sales volume likely to be so responsive to economic worth.

The agricultural engineering profession may properly encourage manufactured buildings with a view of determining fairly and promptly their technical and economic worth. There will be some ethical problems, but they will be similar to those with which power and machinery engineers have long dealt. Surely the need for farm structures demands whatever contribution can be made by manufactured buildings.

Competing with Farm Labor at One Cent an Hour

"COMPARED with human labor, the cost is so low that a man would have to work for less than one cent per hour to compete with it," said A. J. Van Schoick of the New York Power and Light Corporation in concluding a talk, sponsored by the rural electrification section of the General Electric Company, over radio station WGY.

He was talking, apparently, in terms of electrical energy cost alone, based on actual rates and experience among farm customers of his own company. Assuming those rates to be fairly typical, and allowing 100 per cent overhead for equipment charges, it means that a deal of farm work done manually instead of electrically is really worth only two cents an hour. The difference between that rate and a wage of, say, twenty times as much must mean one or more of three things—that farm labor is paid too little, that food consumers pay too much, or that the farm is being operated at a confiscatory loss. At least two of those conditions currently and generally prevail.

In their article on the portable elevator, published in our last issue, Messrs. Atkeson and Beresford established its economics in competition with labor at two dollars a day—surely not a munificient reward for arduous toil, with employment subject to interruption seasonally, and often by weather. The ironic touch comes in the fact that the horse displaced also cost the same two dollars a day, recalling the classic reference to the peasant as brother to the ox, and adding pungency to Dr. E. A. White's already caustic comment on man's use of his body for a prime mover. Yet Idaho, where this experience occurred, is not notably a low-wage area for farm labor.

To the technocratic strain of thought which runs through a considerable part of labor philosophy, electric power at a wage-equivalent of one or two cents an hour is another threat to employment and a force crowding wages downward. Yet, as pointed out variously by Messrs. Davidson, Yerkes, and others, the highest levels both of wages and gainful employment are found to prevail where the largest amounts of power per worker are used. This seems generally true whether comparisons be made by nations or by industries, or whether it be electric, internal-combustion, or animal power.

Of course, the ponderosity of material involved affects the relation. Wages in gem cutting and in earth excavation are not proportional to power consumption. Hence the absolutely large amount of power used in agriculture, when corrected for tonnage of material, is small relative to its accompanying labor, which therefore works at a meager wage. Indeed, ours is perhaps the most difficult branch of engineering in that we must base our economics on one of the lowest wage levels.

To the extent that we can surmount that obstacle we

also reduce its height, and in so doing shall improve greatly the condition of farm labor. It is unimportant whether farm wages be raised and kept raised, or whether the gain be reflected into lower costs and prices for living necessities, these in turn to come back in lower cost and greater abundance of non-agricultural products. In either case real wages and living standards are raised for the farm worker and his family.

In brief, farm wages (whether or not paid as such) are low because too much of farm labor is applied to work that is worth only one or two cents an hour. Increased use of electric energy probably is the most effective way to divert farm labor to work that is worth more.

Limiting Design to the Designer

UNDER circumstances which make it logical, and in an atmosphere of friendly fellowship which a few words of type cannot reflect, the point is sometimes made that engineers in what we broadly call the educational wing of our profession should refrain from stating opinion or conclusion in terms of specific design. This does not, as might seem, spring to any degree from factional jealousy by engineers of the industry who ultimately must assume responsibility for commercially successful designs.

The objection, rather, is to a subtle and hence dangerous psychology of suggestion—a narrowing of the field for resourceful ingenuity, a handicap to both concept and acceptance of other expedients which may be better. So the point is made that the research or other educational engineer will be most helpful by reporting his findings in terms of described conditions and defined objectives, leaving the field of concrete design wide open, so that every engineer and every idea may start from scratch.

In general this doctrine seems so sound as to commend its observance so far as is fairly feasible. That there are limits to its feasibility comes from a conflicting principle, also psychological in nature.

Compared to the vivid picture of specific mechanisms, statements of pure condition and objective are abstractions, more or less dim and elusive. To be sure, we are trained to capture and handle abstractions, but they never equal the concrete in speed and brilliance of perception. Hence there is place, justified at least by economy in thinking, for crystallization of findings into material design, even though it be at once the target for criticism and rejection. In the sheer fact of affording a tangible target it serves an ample purpose.

Hence the recurring controversy, if such it may be called, between the two procedures should not be silenced nor concluded. So long as the conflicting or competing principles of psychology persist, so long should protagonists rise up to define and defend them, all as and when they come to pertinency in our agenda.

Put Pressure on Running Water

IN THE CYCLES of things, economic and otherwise, running water for the farmstead seems to have lost much of the emphasis that was given to it by educational agencies a few years ago. The percentage of farm homes thus equipped is not yet great enough to justify lapse of promotion from the educational angle.

In our opinion the formation of the Electric Water Systems Council, and the intensified program of sales and advertising by related companies, are most opportune in the interests of better farm living, whatever may be their showing thus far in commercial results. We suspect that the program is one which, considering events as they recently have been and now promise to evolve, will call for more faith and more time to reach full fruition. We feel that these efforts deserve immediate and substantial support from the educational and public-promotional angles.

Inclusion of a substantial rural electrification project in the federal work relief program makes renewed emphasis on running water all the more needed. Union of running water with electricity has developed so far that water-system activity is largely a phase of rural electrification—water by wire, if you please. Probably no other use of electricity can make so strong and so general an appeal to prospective farm consumers of electric energy, nor so great a contribution to their living standards.

Yet running water deserves support not alone for its own sake, nor as an ally of electricity, but as a nucleus for a whole list of human betterments. Not as necessary accompaniments but as logical followers it brings all the equipment of the modern bathroom; septic tanks or other sanitary disposal of wastes; efficient equipment in dairy, poultry, and other animal quarters. It invites the pleasures of sprinkled lawns, flowers, and kitchen gardens. It offers a degree of fire protection. Richly worthwhile these are as consumer benefits; as investments in materials and equipment they are desirable contributions to activity in a host of industries.

Indeed, it is not too far-fetched to hope that the house being altered to admit a bathroom may be thoroughly remodeled; that the installation of watering cups may tip the balance in a decision to build new dairy quarters. So pervasive is the power of running water, in building up the appetite for generally better material comforts, that it may be a large factor in arriving at the long-needed renaissance in farm building.

State agencies have demonstrated their efficacy in running water campaigns. Dovetailing with federal work on the electrical aspect, and organized promotion from the commercial side, renewed campaigns in the states should be doubly or trebly productive.

A Correction

THE AUTHORS of the paper, entitled "New Power Equipment for Terracing," appearing in the March 1935 AGRICULTURAL ENGINEERING, call attention to the omission, in the printing of the paper, of two words from the authors' manuscript. In the first paragraph in the left-hand column on page 95, the first sentence of this paragraph, in which the omission appears, should read "Since Diesel fuels are non-taxable in Alabama, only tractors using Diesel *motors or* engines capable of satisfactorily operating on similar low-priced fuels were considered." The omission of the words "motors or" from the authors' manuscript is regretted because it might seem to imply the exclusion of Otto cycle engines using heavy fuels which, from the tax standpoint, are equally admissible. Some of the outfits used in connection with the Alabama cooperative program on terracing equipment embodied engines of this type.

Some Present Day Demands Influencing Farm Building Design[1]

By J. C. Wooley[2]

FARM BUILDINGS serve over a long period of time. It has been said that one generation plans for the next in farm buildings. While this statement is true to a great extent, and changes in buildings come rather slowly, still there are some rather important demands and definite requirements that must be considered from time to time. In comparison with some other changes that have come, they may appear to be rather slow; however, some of these modern demands are insistent and are already having an effect.

First, there is a demand for an increase in the salability of products from the farm. This improvement may be influenced by the question of sanitation, or it may be governed by the time factor requiring storage.

The salability of milk and cream from the farms of the Middle West can be improved by a general adoption of higher standards in its production. These higher standards are for the most part influenced by sanitation and must, of course, come through the producers themselves, but the buildings he uses will be one of the important factors in making the improvement. The conditions under which milk, probably the most easily contaminated of all foods, is handled are notably bad and offer a challenge for their improvement to designers as well as extension workers throughout the Middle West. Workable plans for wall and ceiling construction, lighting, and ventilation must be worked out and placed in the hands of our extension workers, if we are to meet this challenge. In some cases it may be necessary to change the whole plan of procedure to the loafing barn idea to meet the problem. Whatever plan is adopted the designer of farm buildings must furnish the basis for the improvement. Buildings for storage of milk and cream and the equipment required in their care need the careful study of the designer, especially if his designs are utilized by the small producer.

Poultry structures are also influenced by this demand for increased salability of products. Eggs from some of the Middle West states cannot command the best price because of the fact that they are not stored properly on the farm or in the local produce house. Here is a problem of design on which most poultrymen will give their cooperation the solution of which will bring large monetary returns to the farmers of the state.

Many sections produce a limited amount of high-quality fruits and vegetables but lack facilities for storage and marketing. Buildings for storage, especially for the comparatively small grower, await the application of present knowledge or perhaps may require research before structures can be provided.

Individual roadside markets, or perhaps structures for cooperative markets, are needed to place before the buying public the surplus products of the farm. The design of these structures falls logically to the agricultural engineer, because he is in a position to know the needs and furnish the designs. Such structures designed from available scientific information will aid materially in meeting the demand for increased salability of the farmer's products.

The second factor influencing design is the universal insistence on higher production per animal. The government control program, the ton-litter contests, cow-testing associations, baby beef competition, and the like, encourage this tendency. Better housing is coming to be recognized to be one of the basic requirements. Our ability to meet this need will depend upon our knowledge of the environment needed for the animals to be housed and our ability to furnish designs which will be acceptable to the farmer, and which will provide the conditions needed for increased production. Much has been done in the past to provide the conditions, but in many cases the farmer has not accepted the solution. Either he must be educated up to the plan or more economical means must be devised to accomplish the proper results.

The third factor influencing building design and arrangement is the need for control of parasites and disease. The complete change in the structures for hog production which came about on account of the serious damage by the round worm, is evidence of the influence of this demand. Within a short period, thousands of farmers have completely changed their methods of hog production and adopted a method requiring a change in housing and an enormous increase in the chore requirements for the enterprise. The frequent testing of farm animals for tuberculosis, for Bang's disease, etc., creates a demand for buildings which will aid in the control program. Roup in poultry can be controlled only under good conditions of

[1]Paper presented at a meeting of the Farm Structures Division of the American Society of Agricultural Engineers at Chicago, December 3 and 4, 1934.

[2]Professor and head of the agricultural engineering department, University of Missouri. Mem. ASAE.

housing. Producers who have suffered losses from this disease are ready to adopt plans for structures that will aid in its control.

The substitution of artificial light or special feeds for direct sunshine permits of economies in design not permissible before these developments. This is especially true in poultry house design where the open front was considered essential for the direct sunlight effect. Since the direct sunshine may be substituted for in the feed, the house may be closed and much better regulation of the heat secured.

A fourth factor requiring a change in building design comes as a result of the development of machinery for processing and handling hay, grain, and other crops. The space for storing hay can not only be reduced, but can be changed into a more economical shape. Instead of avoiding height and spreading out over a large area, as has been done for loose hay, cut hay can easily be blown into a silo-like structure of very much reduced cost. Cribs and granaries need not be made low to facilitate filling, but may be designed more economically due to handling machinery available. Feed grinders with blower elevators make it possible to deliver ground feed to overhead bins where gravity may be utilized to supply it in small quantities as needed. This feature makes it possible to utilize ground floor space to better advantage. The increasing adoption of such machinery presents a problem in design of structures which must be met.

A fifth factor warranting consideration in building design comes from an unconscious desire for more pleasant and attractive employment in agriculture. Work in industry is made as desirable as possible for the worker. Buildings planned to permit the worker to do each of the processes with a minimum of physical effort, the group arranged properly and supplemented with lanes, yards, and gates, so that livestock may be kept under control at all times, all-weather yards and walks provided where needed will probably add more to the desirability of farm work in the mind of the farm boy than any other single factor. The filling station job is attractive to him because he is provided with pleasant surroundings and equipped, even to his suit, with everything needed to make him efficient. It has been said that "drudgery consists in doing tasks by an inferior method." When we furnish plans, acceptable to the farmer, efficient to the extent that drudgery is removed, we will have met the challenge created by this demand for more pleasant and attractive conditions for farm workers.

Going now to the sixth factor, structure design can have an influence on distribution of labor on the farm. At harvest time there is a peak load, and throughout the winter season a falling off in the demand for farm labor. The designer of farm structures may aid in the solution of this problem. Let me illustrate by offering an example. The Sni-a-Bar farm, belonging to the Kansas City Star, is equipped with buildings designed to decrease the labor at harvest time and perhaps increase it during the winter season. Each of the hay fields is equipped with a structure for storage of hay produced in that field. Short hauls, most of them made with a buck rake enable fewer hands to care for the crop at harvest. At the farmstead proper the barns are of the single-story type, each equipped with space for one week's supply of feed and bedding. During the winter the hay and bedding are transferred from the fields and placed in the barns as needed. More men can be profitably employed the year through, and perhaps the cost of structures may be reduced by this method.

This plan encourages a study of the value of the farmer's time at different seasons of the year. What is the farmer's time worth per hour at seeding or at the harvest season, and what is it worth during the winter? If the demands on his time can be decreased in the busy season at least to the point where he can be efficient and the overload carried over to the slack time in winter by design of structures and equipment, then the effort will have been worth while.

In connection with the seventh factor we are considering in this paper, a study of buildings in northwest Missouri impressed those of us who were making it with a need for an increase in the use of buildings. The farm that had the highest investment in buildings in this study had the lowest building charge per animal unit because the buildings were built to meet the needs. The difficulty comes from the fact that markets change; farms change hands, resulting in the adoption of new enterprises so that it is difficult to make plans that will prove to be efficient over their normal period of service, probably half a century. This encourages a careful study of design and materials so that obsolete buildings may be moved to other farms where they would meet the needs there, or so that they could be dismantled and have a junk value of importance. Designs might be made to facilitate remodeling to suit possible changes in enterprises. If information were available, a knowledge of the highest efficiency in the use of the land *(Continued on page 186)*

An important factor affecting farm building design results from the use of machinery for processing and handling hay, grain, etc. For example, feed grinders with blower elevators make it possible to deliver ground feed to overhead bins where gravity may be used to supply it in small quantities as needed. With this feature ground floor space is utilized to better advantage

The Use of Colored Light in Electrocuting Traps for the Control of the Grape Leafhopper[1]

By W. B. Herms[2] and Joe K. Ellsworth[3]

IT IS QUITE obvious to the most casual observer that light exercises a powerful influence over the behavior of many insects. Frequently myriads of these little creatures are observed flying about street lights. You have often seen a moth fluttering against a window pane in an endeavor to reach the light inside the room. On the other hand, some insects, for example certain species of mosquitoes, attack their prey in darkness. The explanation of these differences of behavior is not as simple as it might appear.

In the case of positively phototactic insects, white light, because it comprises the entire visible spectrum, attracts many species of insects, the injurious as well as the beneficial. In our laboratory experiments we have found that there is a difference in the potency of the various portions of the spectrum. For example, certain insects if given a choice of color will respond to blue, while others respond to red, and still others are markedly attracted to the ultraviolet end of the spectrum. Thus we have reached a conclusion that color exerts a selective influence, and by this means we are able to attract certain insects and exclude others. We have also found that the sexes react differently to the various colors and quite often in a large enough proportion to effect control.

Having attracted the particular insect pest with the proper lure (i. e., colored light), it is then necessary to devise a means of destruction. Various methods have been employed such as oil, suction fans, and, in this case, electrocution.

The grape leafhopper [*Erythroneura comes* (Say)] is one of these phototactic insects, which responds to certain colors as we shall see. Success in its control depends on the means appropriate to that phase of the life cycle which is to be attacked. For example, a liquid spray such as oil-pyrethrum has been found to be quite effective against the first brood of nymphs (immature hoppers). Also calcium cyanide dust has been successfully used, when weather conditions are suitable for its application, that is, dead calm and high humidity. However, this is a deadly poisonous gas and a little wind will create a danger zone of some distance. It can readily be seen that each of the more successful methods now in use has definite limitations.

Although the grape leafhopper does not migrate in the true sense of the word, it is constantly dispersing from one locality to another, moving readily from heavily infested areas into more recently treated fields. Therefore, any method of control that is now in use must be consistently repeated, in order to take care of these dispersing forms.

It is believed that the daily removal of leafhoppers, especially gravid females, throughout the season from a given area would constitute an ideal method of control. This procedure with the present-day chemical methods immediately becomes a difficult problem and too expensive to contemplate. However, if devices of low operating cost were placed in the vineyards to attract and kill daily the local adult hoppers, as well as the invaders, an economical means of control would be at hand.

With this type of program in mind, the agricultural experiment station of the University of California, with the cooperation of the Southern California Edison Company, Ltd., and under the patronage of the California Committee on the Relation of Electricity to Agriculture, undertook the investigation. We are greatly indebted to Mr. Emil J. Smith, agricultural advisor of the Southern California Edison Company, for his painstaking efforts in assisting with the experiment at Delano, and we greatly appreciate the cooperation of the farmers who so willingly placed their plantings at our disposal. The insect electrocuters that were used in these experiments were made particularly for these tests by Dr. L. T. Jones of the Monolite Company, Berkeley.

The five vineyards used in this Delano experiment were located one mile north of the Delano High School in northern Kern County. Field No. 1, the property of Mr. A. A. Green, consisting of eight acres of mixed varieties of grapes, contained four "Monolite" traps (Nos. 1, 2, 6, and 7, vide Table I) with midnight blue lights (all 60-watt, mercury-discharge tubes of dark blue glass.) Later, realizing that one trap per acre was necessary for control, three more traps with midnight blue lights were added, one (No. 4) on June 4, and the other two (Nos. 3 and 5) on July 13, 1934. Field No. 2, on the old Wood's ranch, operated by Mr. J. Cobb with the Thompson Seedless variety of grapes, contained three traps: A red (No. 10) light (60-watt neon discharge tube of clear glass); a midnight blue (No. 9) light (60-watt, mercury-discharge tube of dark blue glass), which was changed on August 23 to a pale blue light (60-watt, mercury-discharge tube of clear glass), and a white light, Trap No. 8 (60-watt frosted Mazda lamp), which was changed on March 30 to a white light (150-watt frosted Mazda lamp), and again changed on July 23 to a 100-watt daylight Mazda lamp. These several colored lights of different intensities are utilized in experiments of this type, in order that the most efficient device might be secured. Realizing the need for information regarding the response of the grape leafhopper to lights of higher intensities, two traps were added to this field, one on July 13, which contained a white light, Trap No. 11, (300-watt frosted Mazda lamp) and the other on August 6, a pale blue light (120-watt, mercury-discharge tube of clear glass).

Field No. 3 belonging to the Vanetti vineyards, consisting of Alacante Bouchet grapes, was used as a check. No other methods of control were employed on any of the three fields except that of the lights. The other two fields that were used as checks had the usual applications of oil-pyrethrum and cyanogas. At the time of the installation, March 16, the leaves of the grape vines were about the size of a half dollar, and most of the hoppers were in the barley strips in the center of the rows and were just beginning to move into the vines.

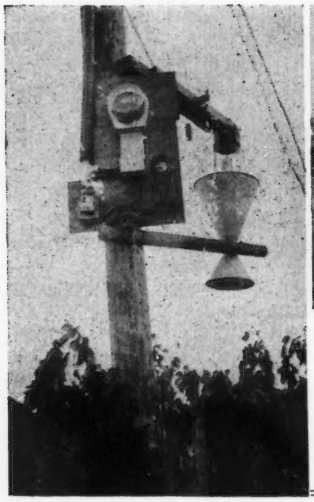
The power lines were strung across the fields to pro-

---

[1]Paper presented (by Mr. Ellsworth) at the spring meeting of the Pacific Coast Section of the American Society of Agricultural Engineers at Porterville, California, April 5 and 6, 1935.

[2]Professor of parasitology, University of California.

[3]Assistant in entomology, University of California.



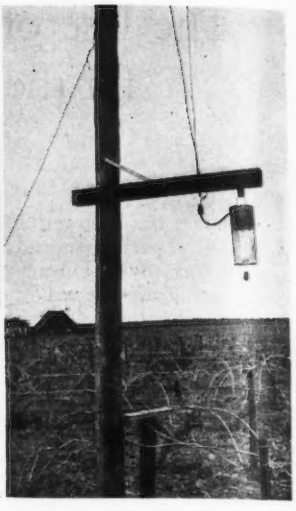


Fig. 1 (Left) This shows one of the traps with funnel in place for catching the insects after being electrocuted—also meter board, switch, and control clock. Fig. 2 (Above) General view of vineyard and overhead installation of electrical supply wires. Fig. 3 (Right) Manner of suspending trap so it will not be affected by wind

vide power for the traps in their respective positions (Figs. 1, 2, and 3). We used the regulation poles as supports, from which the traps were suspended so that the bottoms were 2 ft above the tops of the vines. It was necessary that these lines have a 16-ft working clearance in order to comply with regulations of the Industrial Accident Commission relating to a utility company operating on private land. This resulted in additional expense. It is contemplated, however, that the power company will drop a line at the edge of the vineyard, from which point the farmer can carry his own power line to the several traps. A great reduction in the cost of installation would thereby be accomplished.

The installation may be either one of two general types. The underground type is slightly more expensive, but results in a more attractive installation. The overhead installation, however, has the advantage of a slightly lower first cost. The operating cost of the two types is of course identical, since the power consumed is a function of the device.

In the overhead installation it is customary to proceed from the electrical supply lines adjacent to the pumping plant. A pair of wires supplying the power may usually be carried adequately by the poles which support the traps, since the distance between the traps may be spanned by the wires.

Since adequate control is apparently obtained by one trap to the acre, it is generally convenient to place them at intervals of approximately 200 ft, the actual positions being dependent somewhat upon the shape of the vineyard and the particular or special difficulties that may be encountered in providing sufficient control at heavily infested borders. Fig. 2 gives a general view of an overhead installation showing the position of the pole in the vine row. Placing of the pole in the line of vines and between two adjacent vines permits cultivation of the vineyard without obstruction.

Fig. 3 shows the manner in which the trap is suspended from an intermediate cross arm and the manner in which the supply leads are brought down to energize the trap. The manner of suspension of the trap is one which permits it to function without molestation by the wind. Generally, no provision is made for the collection of insects electrocuted; however, in an experimental installation it is desirable to make accurate counts of the insects which are caught. For the purpose of catching the insects as they fall after being electrocuted, large funnels (18 by 18 in), with attached two-quart, wide mouthed mason jars, as shown in Fig. 1, were suspended under the traps. An inverted funnel (10 by 8 in), covered inside with asbestos, was placed over the jars to reflect the sun's rays, in order to avoid accumulation of moisture and spoilage of the insect catches. Fig. 1 shows a funnel and jar in place. Here is also shown the meter board, switch, and control clock, since the particular trap shown is at the point of supply of this particular installation. These jars were emptied every Monday, Wednesday, and Friday, or on the morning following a rain. The grape leafhoppers were seggregated by means of a series of screens and counted.

In the underground installation the supply current is conveyed through a two-wire tellurium cable embedded at a depth of some 18 in between adjacent rows. This depth must be below that of cultivation and subsoiling operations.

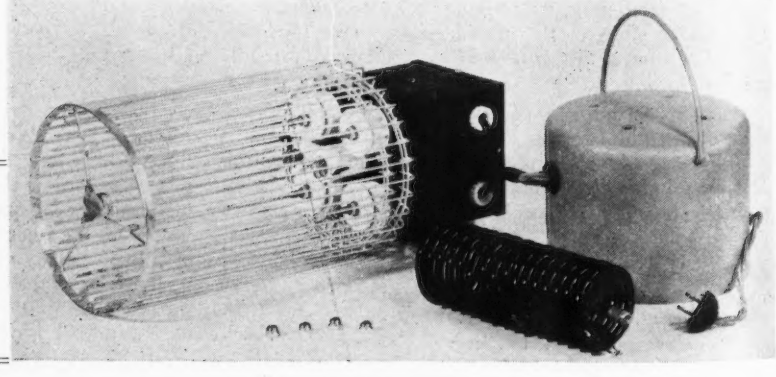


Fig. 4 A detailed view of the "Monolite" trap (insect electrocutor) made especially for the experiments conducted at the California Agricultural Experiment Station for the control of the grape leafhopper and described in the accompanying paper

Fig. 5 (Extreme left) A general view of the electrocuting trap and how it is supported near the top of a rather short pole in the underground installation. Fig. 6 (Middle) A view of the trench used in embedding the supply cable in the underground installation. Fig. 7 (Left) Cross trench which connects the main trench with the pole

The trap is supported near the top of a rather short pole, as shown in Fig. 5, which is placed in the row of vines to permit free cultivation.

Fig. 6 shows a general view of the type of trench used in embedding the supply cable, the trench being midway between the vine rows. Fig. 7 shows the cross trench which connects the main trench with the pole. The cable is brought to the surface and up along the side of the pole to the trap, care being taken to provide protection of the vertical cable from chance damage by cultivating machinery. Both the underground and the overhead types of installation afford entire freedom from obstruction during cultivation.

A general view of the trap is shown in Fig. 5, and a more detailed view in Fig. 4. The trap consists primarily of a wire cage some 8 in in diameter, the alternate wires being connected to the terminals of a transformer which thus supplies the voltage necessary for the electrocution of the insects. The quality of the porcelain insulation, the manner in which the transformer is embedded in its box, and the protecting cover for the trap assure freedom from difficulty even during rainy weather.

The luminescent tube used as a lure is suspended along the axis of the wire cage to insure that the insect comes in contact with the wires as it flies toward the light. The durability and low operating cost over a period of years is dependent upon freedom from corrosion of the metal parts and the life of the luminescent tube. The electrocuting wires are of stainless steel and the luminescent tube has a proved life of more than ten years.

The lights were turned on every night at 6 o'clock and turned off the next morning at six by an automatic switch. The average sunset temperature for the period March 16 to September 1, was 80 deg F. This is mentioned because it is during this time and shortly after that the peak of hopper flights occur, and there is a direct correlation between temperature and insect kill.

Only a portion of the data of daily temperatures and the number of grape leafhoppers electrocuted are shown in Table 1. The counts represent a fair sampling of the collections that were made continuously from March 16 to October 23, 1934.

The total number of leafhoppers killed is of course only relative; however, a few figures of the numbers killed per night with the various colored lights of different intensities are of interest (Table 2). There is a marked increase in the number of hoppers, almost twice as many, attracted to the 60-watt midnight blue tube (764) as compared with those attracted to the Mazda lamp (399) of the same intensity. Again, when the catch from the 120-watt pale blue tube (4631) is compared with the catch from the 60-watt midnight blue tube (1789), a doubling of the intensity as well as a slight change in the color brings about an almost three-fold increase in numbers.

The data in Table 2, along with that in Table 4, further emphasize the fact that the intensity as well as the color of the light exerts a powerful selective influence over the behavior of the insect.

Three population counts were made in the experimental fields, the results of which are shown in Table 3. It is quite evident that the light traps removed a sufficient number of leafhoppers from Field No. 1, so that the few remaining on the vines were of no consequence. While the hoppers in the check fields, despite the use of oil-pyrethrum and cyanogas, increased in numbers until considerable damage done by them was evident. This fact is illustrated in Figs. 8 and 9. Fig. 8 shows a portion of the healthy vines located in Field No. 1 near Trap No. 1. The leaves are full sized, dense, and afford sufficient protection for the grapes against the burning sun and the dry wind. Fig. 9 shows a portion of a vine in one of the treated fields (oil-pyrethrum and cyanogas). Here we see a marked difference; the leaves are discolored, small, and stunted, leaving the grapes exposed to sun and wind.

Fig. 8 (Left) A portion of the healthy vines in Field No. 1 near Trap No. 1. Fig. 9 (Right) A portion of a vine in one of the treated fields (oil-pyrethrum and cyanogas)

Table 1. Number of Grape Leafhoppers Captured in Light Traps During Parts of March, April, May, June, July, and August, a Fair Sample of Collections Made Continuously Throughout the Period of Illumination

Date, 1934	Temperature, deg F minimum	maximum	Number of Grape Leafhoppers Field No. 1 No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	Field No. 2 No. 8	No. 9	No. 10	No. 11
Mar. 21	47	73	1121	1644				1205	1604	1101	1011	1661	
Mar. 22	46	76											
Mar. 23	47	71	1322	1696				1121	1455	1009	1112	1790	
Apri. 23	45	79	2191	2055				1818	1788	2555	1606	2052	
Apr. 24	50	82											
Apr. 25	50	86	1955	1918				1760	1705	2117	1405	2050	
May 21	54	104	2105	2105				2055	2025	1907	1960	1935	
May 22	59	100											
May 23	53	88	1990	1955				1887	1895	1930	1950	1965	
June 22	55	104	2590	2255		3455		2650	1925	2450	3460	2260	
June 23	68	103											
June 24	56	89											
June 25	55	78	1955	1920		2990		2015	1520	1920	2760	1690	
July 20	60	97	2110	2015	2930	2605	2880	2050	1875	2050	2830	2950	4755
July 21	60	95											
July 22	60	95											
July 23	59	98	2650	1965	2650	2455	2750	2525	2205	1855	2450	1760	4625
Aug. 24	58	96	1950	1920	3020	1820	2500	1920	1950	1920	1950	1720	5525
Aug. 25	59	94											
Aug. 26	57	90											
Aug. 27	54	88	1875	1900	2990	1850	2330	1855	1805	1820	1900	1700	5005

Table 2. The Number of Grape Leafhoppers Captured per Night in Light Traps with Various Colored Lights of Different Intensities

Color and intensity of the lights	March 18 to June 1	July 24 to August 23	August 27 to October 23
60-watt midnight blue tube	764	517	1789
120-watt pale blue tube			4631
60-watt red discharge tube	867	463	
60-watt frosted Mazda lamp	399		
150-watt frosted Mazda lamp		402	
300-watt frosted Mazda lamp		1432	

Table 3. Grape Leafhopper Population Counts (Average for Several Stations)

Date, 1934	Test plot (blue lights) Number of stations	Leafhoppers per vine	Check plot (no control) Number of stations	Leafhoppers per vine
May 2	15	68.7	5	280.0
May 16	6	53.7	4	383.2
July 11	9	77.6	2	1280.0

Table 4. Sex Ratio of Grape Leafhoppers Taken in the Light Traps and from the Vines in the Fields

Date of test	Color and intensity of the lights	Total killed	Per cent, females	Ratio, females to males
March 30	60-watt midnight blue tube	1759	88	7:1
	60-watt red discharge tube	2966	7	1:13
	60-watt frosted Mazda lamp	1012	38	4:7
July 23	60-watt midnight blue tube	2336	63	7:4
	Normal in Field No. 1		30	3:7
	60-watt red discharge tube	1760	9	1:10
	150-watt frosted Mazda lamp	1855	40	2:3
	300-watt frosted Mazda lamp	4625	49	1:1
	Normal in Field No. 2		36	4:7

On March 30 and July 23, 1934, two sex ratio counts were made of the leafhoppers captured in the various traps. The sex ratio counts of the leafhoppers taken in the population counts are also shown in Table 4, as is the normal sex ratio existing in the fields at this time. It will be noted that of the insects attracted to the blue light 88 per cent were females, while of those attracted to the red light only 7 per cent were females. It is of importance to note that the normal field population of leafhoppers at this time showed 30 per cent females. The significance of these observations is obvious.

We have reached the conclusion based on the field tests described above that a sufficient number of leafhoppers were removed daily by one trap to the acre, so that the few insects remaining on the vines were of little consequence. Besides effecting a positive control of the vinehopper, the insect electrocuters proved of great value in the control of such insects as the moths of the corn ear worm and the army worm.

We wish to emphasize the fact that this paper is in the nature of a progress report of our first year's test. Installations for a second year's test of the control of the grape leafhopper are now established at Delano, Madera, Modesto, Escalon, and Tracy. It is believed that successful operation of these five installations will establish the light-electrocution method as one of the primary methods of control for the grape leafhopper in California vineyards.

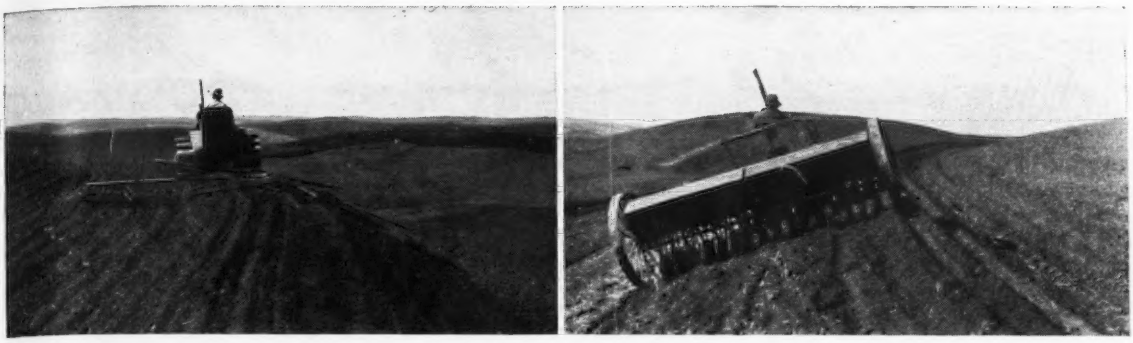
Some Present Day Demands Influencing Farm Building Design

(Continued from page 182)

on the farm would enable the engineer to design structures to meet the needs of the farm. Since the farmer is an individualist and does not always make the best use of his farm, the problem will probably be difficult and the obsolescence factor will still take a considerable toll.

As to the eighth factor influencing design, the demand for farm dwellings that will give more service and require less care is upon us. The demands upon farm women for attention to educational, social, and political problems in their communities require that they give less time to the tasks of housekeeping and still maintain the home at an even higher standard of efficiency. This requires an appreciation of the problems to be met and a knowledge of plans, arrangement, and equipment best fitted for their solution. In addition to this, the designer must recognize the economic and educational problems involved in securing adoption of plans before they will be effective.

Many of these factors influencing design are not new, but it seems to me they are much better recognized and much more insistent than ever before, offering those interested in design an unusual opportunity for service.



(Left) Harrowing a terrace on Pacific Northwest Soil Erosion Experiment Station of the U. S. Department of Agriculture. (Right) Drilling wheat on terraced land at the Pacific Northwest Soil Erosion Experiment Station. Land slope of 25 per cent

Engineering Experiments in Soil Erosion Control in the Northwest[1]

By P. C. McGrew[2]

IN THE FALL of 1930 one of the federal soil erosion experiment stations was established with headquarters at Pullman, Washington, to study the erosion control problem in the states of Oregon, Washington, and Idaho. There are, in general, three types of erosion in this area. These are sheet erosion, gully erosion, due to rainfall or melting snow, and wind erosion in the dryer sections of the states. Stream bank erosion and coast line erosion are serious in some places west of the mountains, but so far we have not studied these except in a minor way. The engineering work of the station deals largely with machinery, terracing, check dams for gully control, and the measurement of runoff from field areas and watersheds.

The effectiveness of any control method is, whenever possible, determined by actual measurements of the runoff and soil losses as compared to check areas where the particular erosion control measure is not used. For the field areas and watersheds the Parshall measuring flume with waterstage recorder and the Ramser silt sampler have been used to determine the runoff and soil losses. The Parshall flume is very well adapted as it is self-cleaning, does not require a stilling basin above the entrance, and is not affected appreciably by the velocity of approach. The Ramser silt sampler, which was first used about five years ago, has been very successful in obtaining the measurements of the soil losses.

This installation consists of a settling basin at the lower end of the Parshall flume which often causes as much as half of the soil to settle. At the outlet end of this settling basin is a steel weir over which the water flows. At the side of the settling basin, 2 ft back from the steel weir, is a slot which takes off an aliquot, the elevation of the slot being the same as the weir. The aliquot is further divided by a divisor box 10 by 20 in with two outlet weirs, one 3 in and the other ½ in, the portion of the runoff flowing through the ½-in weir being retained as the final sample. The slot in the side of the settling basin is protected from floating debris by a suitable screen which is practically self-cleaning as the water flows by the screen rather than against it.

This installation has been very successful at the Pullman station, and during the past three years has not failed in a single instance due to floating debris or clogging; it is used on areas from about ¾ acre up to 5 acres. The only limitation with regard to the size of watershed is the cost of installation and the cost of emptying the silt box. The size of silt box must be increased as the size of watershed increases. In the case of a watershed having continuous runoff, it would be necessary to divert this water while emptying the silt box. The total soil loss is the amount of soil in the settling box plus the soil passing over the outlet weir as determined from the aliquot sample. In the case of areas of from 15 acres to 16,704 acres, the soil loss was determined from hand samples taken during runoff periods.

The yearly distribution of rainfall at Pullman, Washington, which is typical of the region, shows that the heavy precipitation occurs during the period from November to March with the least amount during July and August. Occasional heavy summer rains may cause serious soil losses in local areas, but the erosion problem is essentially a winter erosion problem.

The average soil loss from field areas of from 2⅓ to 68 acres, with a cropping system of winter wheat fallow, was 16.8 tons per acre per year. The average annual runoff was 9.25 in per year, or 34.8 per cent of the rainfall. During 1933 the runoff and soil losses were measured for a typical agricultural area totaling 16,704 acres. The average soil loss was 8¼ tons per acre. The runoff amounted to 13 in, including seepage as well as surface runoff, which is 45 per cent of the total recorded rainfall. The rainfall was recorded by a gauge at the edge of the area, however, and it is believed that the average rainfall over this watershed was one or two inches more than that recorded by the gauge, so that a figure of 40 per cent runoff would probably be more accurate than 45 per cent. This soil loss includes only the soil carried entirely out of the area by the runoff water and does not include the large soil deposits on many of the lower slopes and valleys. When it is considered that there were included some grass, alfalfa, and timber areas from which the loss was small, it is readily seen that the

---

[1]Paper presented at a meeting of the Pacific Coast Section of the American Society of Agricultural Engineers at Corvallis, Oregon, December 28 and 29, 1934.

[2]Agricultural engineer, Bureau of Agricultural Engineering, U. S. Department of Agriculture. Mem. ASAE.

soil loss from the upper cultivated slopes was very large, probably equal to that measured on the smaller areas.

For a cropping system of wheat fallow, the difference in the amount of erosion for the winter season following the harvesting of the wheat crop as compared to the winter season after summer fallow, has been very striking. The soil loss from the stubble field following the wheat crop has averaged 0.32 tons per acre, while the loss for the winter season after summer fallow has averaged 18.44 tons per acre.

Terraces were constructed at the station on land slopes of 12 to 32 per cent to study this method of control, the experiments including the length of terraces, grades, spacing, effect of land slopes, and level terraces.

The soil loss increased for the steeper land slopes for terraces 780 ft long with grades of 12 in fall per 100 ft.

Terrace No.	Land slope, per cent	Soil loss per year tons per acre
7	14.5	0.57 (two-year average)
5	20.0	1.82 (two-year average)
17	23.5	7.20 (two-year average)
3A	27.6	5.11 (one-year result)

The soil differences are believed to have exaggerated the differences in the case of this experiment and may account for a smaller soil loss from the 27.6 per cent slope than for the 23.5 per cent slope.

The soil loss increased as the fall along the terrace channel was increased, the comparison being as follows:

Terrace No.	Fall along terrace channel in/100 ft	Land slope, per cent	Average annual soil loss, tons per acre
13	0 (level)	15.2	1.28 (1-yr result)
18	6	18.4	2.90 (2-yr average)
17	12	23.5	7.20 (2-yr average)
16	18	26.7	10.36 (2-yr average)
15	24	24.0	13.67 (1-yr result)

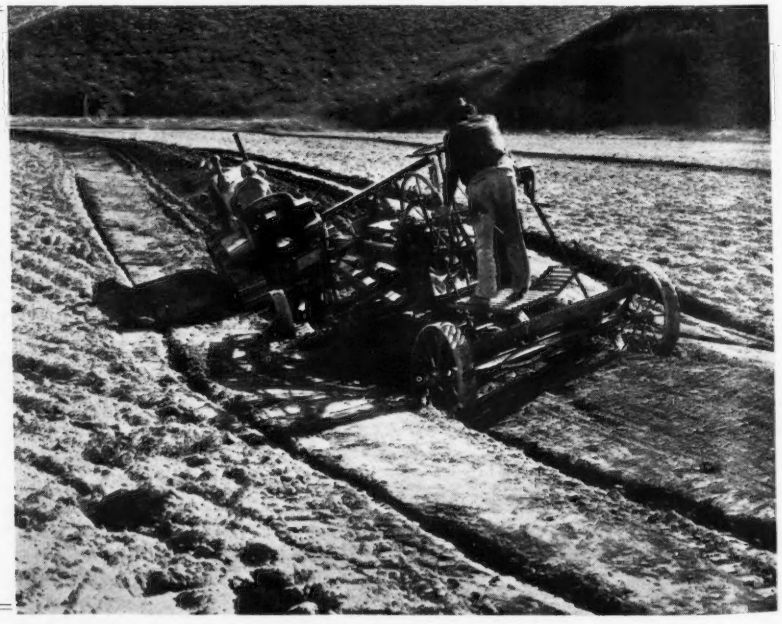
The experiments on the vertical spacing of terraces were influenced to such an extent by differences in land slope and soil that the result is obscure, the comparative soil losses being as follows:

Terrace No.	Vertical spacing, feet	Land slope, per cent	Annual soil loss, tons per acre
5	15	20.0	1.82 (2-yr average)
3A	15	27.6	5.11 (1-yr result)
3 (1933)	20	27.8	4.56 (1-yr result)
4	25	23.6	3.03 (2-yr average)
3 (1932)	35	27.7	4.38 (1-yr result)

Certain conclusions can be drawn from these data supplemented by observations during the runoff period. One conclusion is that the terrace with 15-ft vertical spacing on a 20.0 per cent land slope and the terrace with 25-ft vertical spacing on 23.6 per cent slope were satisfactory, although there was more evidence of erosion between terraces for the 25-ft spacing than for the closer spacing. In the case of the 35-ft vertical spacing the washing between terraces was much greater than for closer spacing, and soil deposits in the channel caused overtopping of the terrace. An intermediate terrace was constructed the following year.

Experiments with closed end level terraces indicate that for soil conditions such as occur at this station, it is not practical to hold all the water. In some cases these terraces impounded water continuously for as much as four months. This drainage might be taken care of either by an outlet at one end, or possibly by tile drainage.

The results of the measurements and observations indicate that the vertical spacing of terraces should be 13 ft for a land slope of 15 per cent, and that the spacing should increase or decrease 0.6 ft for each 1 per cent increase or decrease in land slope. The fall along the terrace channel should be about 6 in per 100 ft where the land slope is 15 per cent and should be increased or decreased 2 in for each five per cent increase or decrease in land slope. In the case of terraces more than 1,000 ft long, the variable grade terrace is recommended. The minimum height for terraces 800 ft long should be 12 in after the terrace is settled, and for longer terraces the height near the outlet should be increased about 1 in for each additional 300 ft. As a general rule, terraces should be 25 to 30 ft wide from upper edge of cut to lower edge of embankment. Where the erosion on the gentle slopes is greater than normal, the terraces should be closer together than the above recom-



Building terraces on the California erosion control of the Soil Erosion Service, U. S. Department of Agriculture, in Los Pasos Valley near Santa Paula—a rich farming section, some of the land being valued as high as $5,000 an acre

mendation, and on deep soils having a large absorptive capacity, a wider spacing may be satisfactory. The following table gives the vertical spacing and grades for different land slopes:

Land slope, per cent	Grade, fall in in/100 ft	Vertical spacing, feet	Horizontal spacing, feet
5	2	7*	140
10	4	10*	100
15	6	13	87
20	8	16	80
25	10	19	76
30	12	22	73

*Where the erosion on gentle slopes is greater than normal, the terraces should be closer together.

The terrace outlet ditch should be planned when the terraces are built. If possible, the water from the terraces should outlet into a natural drainage channel where the erosion can be easily controlled. In case a field ditch is necessary, it should be constructed with a wide flat bottom and seeded to a thick-growing grass at the earliest possible date. Brome grass is recommended for this use. Check dams should be installed promptly if necessary.

In constructing terraces on land slopes steeper than about 10 per cent, it is believed that all the soil should be moved from the upper side. The blade-grader type of equipment is generally used in constructing terraces. The average cost at the Pullman station was $2.21 per acre for slopes of from 14.5 to 20.0 per cent and $4.63 per acre for slopes of 20.6 to 27.8 per cent.

The average soil loss of eight graded terraces was 3.96 tons per acre as compared to a soil loss of 16.78 tons per acre for two unterraced areas. The runoff for the terraced land averaged 11.2 per cent of the precipitation, and was 34.8 per cent for the unterraced areas. A considerable portion of the runoff is from melting snow and rain on snow. The snow obstructs the terrace channels to some extent, thus retarding the runoff which allows considerable time for the water to be absorbed, as compared to unterraced areas where the water runs directly down the slope. This snow in the terrace channels has caused overtopping of terraces in a few instances but the damage was slight after the terraces were settled.

The erosion between terraces was not enough to be noticed in operating farm equipment. However, the continued removal of crops along with erosion reduces the organic matter in the soil, and, for a permanent agriculture, a crop rotation should be followed which provides either for growing leguminous crops, such as sweet clover or alfalfa, during part of the rotation, or for building up the fertility by other methods.

The hillside type of combine harvester can cross the terraces easily on slopes less than about 20 per cent and with wheat of fair height the crop can be harvested satisfactorily. Best results have been obtained by operating tillage machinery parallel to the terraces. The tillage implements can cross the terraces occasionally if properly handled, but farming across terraces reduces the heights excessively and may damage the implements.

The burning of wheat stubble in the areas producing heavy growth has become a common practice, especially since the combine has been so widely used. In the case of heavy stubble it is very difficult to plow through the windrow left by the combine. Also this concentration of stubble in the windrow would likely result in a depressed yield if it were plowed. By using a straw spreader on the combine this concentration of straw is avoided, and on most of the land the stubble can be worked into the soil. This practice is beneficial in reducing erosion and the tilth of the soil will be improved by this organic material. In order to handle heavy stubble most effectively, it should be disked or plowed in the fall after harvest, thus obtaining some decomposition over winter and preventing the drying out of the soil such as might occur where heavy stubble is worked in the spring. The working of this stubble into the soil can be done with the one-way disk tiller, heavy tandem disk, or moldboard plow, the type of implement depending upon the size of stubble and equipment available. In case the moldboard plow is used, the furrow should be turned only partly over so that some straw will be left on the surface or projecting from between the furrow slices. The complete burying of the stubble at the bottom of the plowed layer does not give the desired effect and will likely cause erosion during the season immediately following plowing. Some of the experimental work shows a slightly better yield where the stubble is plowed under as compared to burned. (Refer to USDA Technical Bulletin 329. Experiments in Wheat Production on the Dry Land of Oregon, Washington, and Utah, by David E. Stephens, H. M. Wanser, and Aaron F. Bracken.) In order to maintain or build up the fertility most effectively, a legume such as sweet clover or alfalfa should be grown in the rotation. This will also improve the tilth of the soil which increases the rate at which water will be absorbed.

The small field gullies which are crossed in farming operations are more of a problem in some respects than larger gullies which are not crossed. If these small gullies are plowed in year after year and the loose soil washed out the following season, there will soon be a deep depression which finally cannot be crossed. In the case of such gullies, where the drainage area is small, it is frequently possible to hold the soil in place by the use of straw. If a straw dump is used on the combine, the straw can be dumped in the gully in crossing, and if the straw is spread or left in a windrow, it can be raked into the gully. By plowing so as to partly bury this straw, it is possible to hold the soil in the gully, thus obtaining temporary control at a low cost. This practice should not be expected to work on gullies where the drainage area is large, even though the gully may be small. For these larger drainage areas any material placed in the gully should be held in place by some method. Low check dams such as brush or sack dams are effective. These dams should be held in place by stakes and should be built with the center low, so that the water will go over the center instead of around the end, perhaps making a new gully or washing out the dam.

For gullies having a large drainage area and any gullies cutting badly, a combination of check dams and grass seeding is usually the best method of control. In the case of deep gullies it may be advisable to construct low dams and, after soil has been deposited to their capacity, build more dams rather than attempt to fill the gully the desired amount by building high dams at the start. After the soil has been deposited above the dams, the banks can be sloped as desired and the area seeded to a thick-growing grass. In planning dams the channel capacity should be large enough so the water will not be forced out and wash a parallel gully at one side. In dams of this type materials such as brush, woven wire with straw and brush, rock, poles, lumber, or logs can be used, the exact type depending largely on the material available and the desire of those constructing the dams. Where a considerable drop occurs at the edge of the field or where the drainage enters a permanent channel, it may be advisable to construct a permanent type of drop such as concrete or masonry. Logs or plank may also be used for such work and may sometimes be more economical even though it is necessary to replace them in ten or fifteen years.

Teaching Terracing with Blocks

By D. Scoates[1]

THERE ARE essentially four fundamental set-ups for a problem in terracing — the hill (1), the hollow (2), the slope (3), and the flat—all of which are shown in miniature (in the accompanying illustration) in the form of wooden blocks on which all but the last-named contours have been drawn.

The simplest combination with the first block (1), of course, would be the shape of a round hill (4), or instead it could become one-half of three-quarters of a round hill.

Another simple combination using the second block (2) would be four of them put together in the form of a round hollow (5). Of course, this same hollow is found in one-half or three-quarters of that shape.

The slope (3) in combination with itself just becomes an elongated plane (6).

The flat in its simplest combinations becomes just a bigger flat, in a similar manner to the slope.

When one starts to put these four fundamental set-ups or elements together, then the puzzling problems with which nature has confronted the terracer begin to show themselves in their almost numberless ramifications.

Let us proceed through some of the simple ones. For example, put two hollows together with slopes, and a very typical terracing problem (7) comes forth. Conversely, using the same slope with two hills, an equally prevalent problem (8) shows up.

Now, using one each of the hill and the hollow, two slopes and two flats used gives nature in reverse (9), not an unusual way to find her.

Suppose four hollows are used with four slopes. Then we have the stadium terracing problem (10).

To this could be added the following blocks: Two flats at the bottom, two slopes (one at either end), and a wider stadium with flat level land in the bottom would evolve.

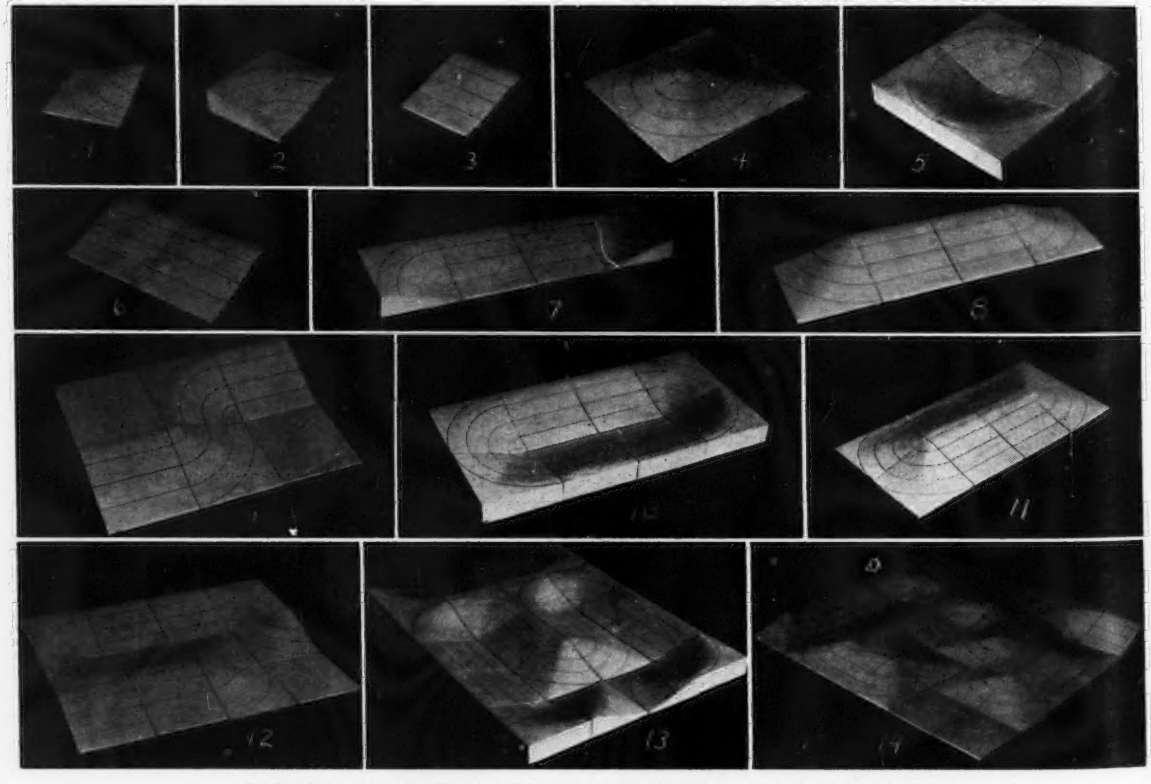
The converse, a long hill made of four hill blocks and four slope blocks, will naturally be thought of as the next problem (11). This can be elongated with flats in a similar way to the stadium problem previously given.

There are a great many other combinations that can be made from these blocks—many simple ones, some more complicated, and still others which tend to become really confusing. Samples of these various possibilities (12, 13, and 14) are shown.

These blocks enable students to visualize the fundamental set-ups to be found, for which a terracing solution must be worked out. The student can be shown the few simple topographical arrangements that he will meet and be taught to solve these, and then he can go to the more complex problems which are really just combinations of the simple ones.

A check of one hundred and eight fields needing ter-

[1]Professor of agricultural engineering, A. & M. College of Texas. Mem. A.S.A.E



Combinations of wooden blocks used in teaching terracing at the A. & M. College of Texas

races near College Station, Texas, showed that 28.7 per cent were simple slopes (3); 7 per cent were hills (1); 13 per cent were hollows (2); 27.8 per cent a combination of two blocks; 12.1 per cent a combination of three blocks; 5.7 per cent a combination of four blocks; 2.8 per cent a combination of nine blocks; 2.8 per cent a combination of twelve blocks. From this check the conclusion can be drawn that, for this immediate vicinity, the terracing problem topographical set-ups are relatively simple.

One of the disadvantages of these blocks is that they show only one degree of slope. This must be kept in mind in working with them.

The blocks shown are made of white pine, 6 in square and 1¾ in thick on the highest side and ¼ in on the low side. Forty blocks made up of eight of each kind will give a very good demonstration set.

Visualizing Soil Erosion Control

By M. F. Thurmond[1]

SOIL EROSION control workers are rapidly becoming more interested in the possibilities of using educational exhibits to supplement other methods of extending better practices in soil erosion control. Ideas presented in exhibits are more readily grasped by farmers, as they are enabled to visualize them much better than those contained in news articles or bulletins.

The merchant is vitally interested in both displaying his wares and showing the results. In the same manner workers in soil erosion control may more easily sell their ideas and methods by the use of educational exhibits.

There are several important factors to be considered in planning the exhibit, such as (1) aim or purpose of exhibit, (2) audience and competition, (3) means of attracting attention, (4) gaining and holding interest, (5) causing a reaction from the people, (6) type of exhibit to use, (7) nature of the story to be told, (8) making the exhibit self-explanatory, (9) advertising, and (10) following up the exhibit.

The exhibit should be planned so that it will not only attract the attention of the audience, but will tend to hold the crowd. A live exhibit is far better than a still one. Moving objects, a change in scenes, or flashing colors will tend to hold the interest of the crowd. Mechanical exhibits that cause motion, or moving water may be used to good advantage.

The exhibit should be self-explanatory as far as possible, by the use of signs. Someone should be in charge at all times to answer questions and hand out literature that may be carried back home.

[1]Associate professor of agricultural engineering, A. & M. College of Texas. Mem. ASAE. (During the summer of 1934 Mr. Thurmond was connected with the Central Texas Project No. 4 of the USDI (now USDA) Soil Erosion Service, at Temple, Texas).

An exhibit was prepared to acquaint the farmers and landowners in the Elm Creek (Texas) watershed with the methods of erosion control being advocated by the USDI (now USDA) Soil Erosion Service. It was also built with the idea of being exhibited at the state fair at Dallas, Texas. The space was determined by the amount available in the exhibit hall at the fair, being 9 by 36 ft with a rear wall space of about 10 ft.

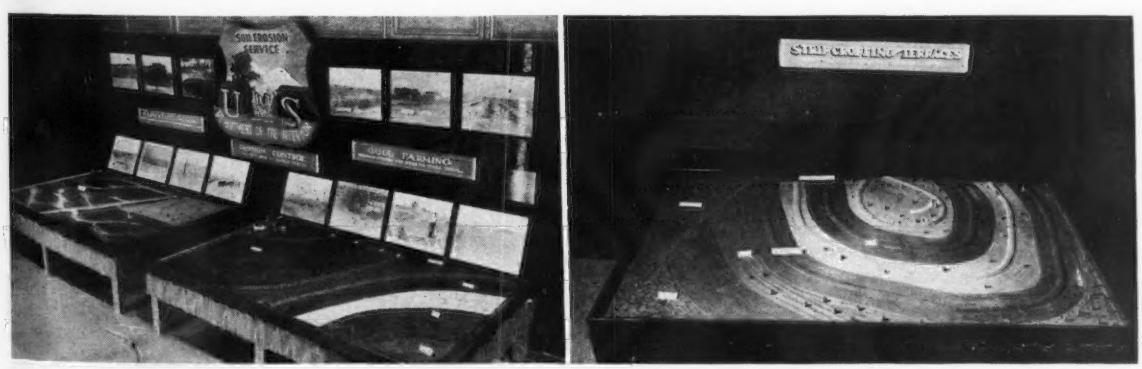
The following soil erosion control methods were featured: (a) terracing, (b) strip cropping, (c) temporary and permanent check dams, (d) vegetation on ditches, (e) pasture contouring, and (f) crop diversification. In addition, home improvements were also featured.

About twenty enlarged photographs, 18 by 24 in, were used as a part of the display. These photographs were taken on farms in the Elm Creek watershed.

Two model farms were built up out of plaster of paris, these being made in boxes of 5 by 8 ft each. The boxes were made very strong, so that they could be moved about. Metal plaster lath was doubled and placed in the bottom of each box. One-half inch of concrete was put on the lath, and used as a base for the plaster. This was done to provide strength and to reinforce the back of the plaster to keep it from cracking. From 1½ to 3 in of plaster was poured in each box and both farms were shaped out exactly alike. The farms were given two slopes with a natural waterway through them.

After the field was shaped and the rows cut, the model was given two coats of thin shellac to waterproof it. The land in row crops was painted with blackboard slating, while the part of the farm planted to oats was painted a straw color, and small shocks of oats made from excelsior were placed in the field.

Different types of sprinkler systems were tried out, but



(Left) This picture shows models of eroded and terraced farms, at the left and right, respectively. (Right) This model is designed to illustrate soil erosion control by a combination of strip-cropping and terracing

the most satisfactory one was a 5/16-in copper tube placed around the field just on the inside of the box. A number of holes were placed in the tube. The method used to provide the holes was to partially drill through the copper tube with a hand drill using a 1/16-in bit; then by the use of a pricking punch and a fine needle, the tiny openings were completed. The copper tube was then connected to the water pressure. A separate cut-off was provided for each sprinkling system and a one-inch hose was connected to the outlet to carry off the surface water.

Farm No. 1 was modeled to represent a very poorly arranged and badly eroded set up with rows running up and down the hill as the average farmer would plan them.

Farm No. 2 was the same as Farm No. 1, but it was properly terraced and strip-cropped, the unproductive land put in pasture and contoured. Sodded ditches and check dams were placed in as needed, and methods of eliminating "point rows" by strip-cropping were demonstrated. The dilapidated farm buildings were replaced by new ones. Some of the buildings were made of wood and some were cut from plaster of paris.

Fences were built by using candy sticks for posts. One-fourth inch hardware cloth at the bottom made a good hog proof fence. Two small wires were used near the top of the posts above the woven wire. Orange shellac was used on the posts, while a drop of white paint on the top of each one made the fences look more attractive.

On land that is not badly eroded and the slope is not too great, strip-cropping may take the place of terracing. Where the slope is greater, it is recommended that terracing and strip-cropping be combined. A model, 5 by 8 ft in size was built, representing about 40 acres of land. The farm was shaped with a low hill at one side. Illustrations were given of how strip-cropping can best be combined with terracing, and how used alone.

One-quarter inch rows were cut for the cultivated crops, and the strips of grain were represented by different colored paint. Small shocks of grain made the strips look very attractive. The entire field was given two coats of shellac before painting. This model was not constructed to receive moisture. The story of planting crops in strips and the elimination of point rows was made easy to understand by anyone viewing the exhibit. Placards were placed at the back of each box, giving a description of the various phases of the exhibit.

Where terrace outlets have an appreciable drop, they must be given protection by the use of vegetation or some type of structure. Terraces left unprotected at the outlets soon gully back into the fields and more erosion follows. To illustrate the use of check dams and how they stop erosion, a model was built up showing a ditch, cutting badly, and by the side of it a ditch with check dams installed.

This model was constructed in the same manner as those described above, being 30 by 60 in. A partition was placed in the center to separate the two ditches. Small dams were placed in one of the ditches. These dams were about 2 in wide and placed about 9 in apart. They were placed in the ditch so that the stilling apron of one would be on a level with the spillway notch of the next dam down stream. The types of dams constructed were brush, log, wire, rock and mortar, formless concrete, and formed concrete.

The same type of sprinkling system was used, as on the other boxes.

The miniature dams in the ditch were too small for one to visualize how they were constructed. To show their type of construction, large-scale models of the six types of dams were made, using a scale two inches to the foot. These dams were placed at one side of the exhibit and small ribbons were run from the small dams to the larger ones.

The large formed and formless concrete dams were made by first shaping metal plaster lath and plastering, using one part of portland cement and three parts of sand. The rock dam was made by using one-inch pebbles built up with one part of cement and two parts of sand. Metal plaster lath was tied to four ¾-in posts for the wire dams. The log dam was constructed by using ¾-in sticks, nailed and wired together. The brush check dam was made of ¼-in limbs and twigs with leaves.

The sodded ditches were constructed by using textone, making it rough and painting green. This gave a good representation of grass.

On the model of the improved terraced farm, contours were placed in the pasture. These contours were built up on the plaster before the model was shellacked. They were cut about one-fourth inch wide. They were placed on the level so as to hold the water back.

A small aluminum string level was used to put in the contours and determine the fall on the terraces.

To call special attention to the devastating results of erosion, and to suggest some measures of control, a cover-crop demonstration was set up. This consisted of three boxes, 30 by 45 in, by 6 in deep. An outlet was placed in the bottom of each box to take care of the percolation. Five small slots, the length of the box, were placed in the bottoms, covered with two pieces of screen wire and two burlap sacks. This allowed the water that percolated through the five inches of soil to drain out and run down on the inside of the bottom of the box. The runoff was caught in carboys, so that the amount of water and soil lost would be plainly visible. These boxes were patterned to some extent after those of F. G. Merkle[2].

The plats were planted to oats, Bermuda grass, and corn with rows running up and down the slope.

The boxes were given a slope of from ten to fifteen per cent. They could be raised or lowered as desired.

The sprinkling system was similar to that used on the other models. Each pan had a separate water cutoff to regulate the pressure.

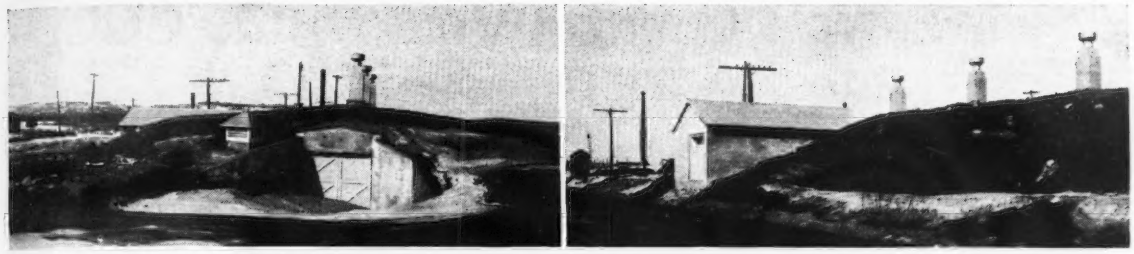
The carboys used to receive the surface runoff were of five-gallon capacity. The attention of visitors was immediately attracted by the fact that the bare soils produced much runoff and that it was turbid, while soil covered with oats and with grass produced but little runoff, which was clear.

Neat, attractive signs were made to make the exhibit self-explanatory. Large photographs were used to attract attention and show methods and results of work being done on erosion control.

---

[2]An Equipment for Demonstrating Soil Erosion and Its Control. F. G. Merkle. Journal of the American Society of Agronomy, July 1934, vol. 26, no. 7.

Models of temporary and permanent check dams, including brush, log, hog wire, rock and mortar, formless concrete, and formed concrete



(Left) The front entrance of concrete potato warehouse through which trucks or wagons are driven for unloading. (Right) The loading platform as seen from the railroad siding

A Monolithic Concrete Potato Warehouse

By M. B. Jensen[1] and F. A. Lyman[2]

POTATO prices are usually higher in winter than at harvest time. This fact, together with freezing temperatures which prevent delivery from farm storage to railroad sidings in winter led to the construction of several potato warehouses in northern Michigan last summer and fall. Potato growers associations were formed in several communities and loans negotiated from the Michigan Rural Rehabilitation Corporation to cover cost of materials. Loans are being paid back by a charge of a few cents per bushel on potatoes in storage.

The concrete potato warehouse built at Merriman in Dickinson County is typical of the 15 or 20 built in Dickinson, Luce, Marquette, and Gogebic Counties. This structure is 100 ft by 50 ft inside dimensions with a 10-ft concrete driveway through the center of the building. Side walls are 18 in thick, using as many field stone in the concrete as possible. The 6-in concrete roof slab is reinforced with steel rails and mesh. Columns, 10 ft on centers, consist of 6-in pipe filled with concrete. The capacity of this warehouse is between 18,000 and 20,000 bu.

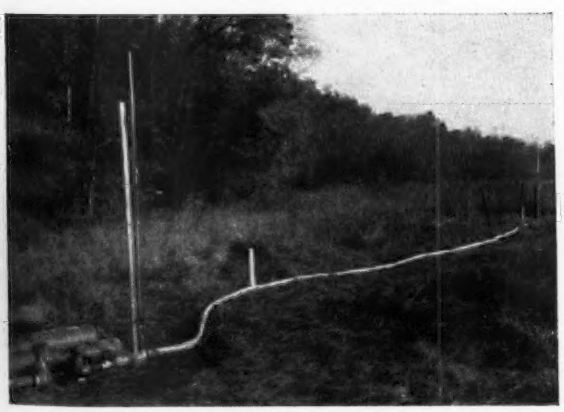
Ventilation is secured by an underground intake running lengthwise of the building with openings under each bin. Three ventilator outlets are provided at the roof.

A 16-by-20-ft loading room with floor at car door height is provided at one corner of the building next to the railroad siding. The location selected permitted the warehouse to be covered with earth.

As reported by E. A. Kronquist, FERA project-engineer for Dickinson County, the cost of this durable, verminproof, and fireproof structure was as follows: Materials, $2362.36; labor (by FERA), $4386.45; and local contributions for equipment rental and supervision, $1205.87.

The success of this project led to designing similar structures at other locations in these counties.

[1]Field engineer, Portland Cement Association.
[2]Portland Cement Association. Assoc. Mem. ASAE.



Arrangement used for testing rates of flow from porous canvas irrigation hose

Rates of Flow from Porous Hose

By F. E. Staebner[1]

ALTHOUGH it is commonly recognized that only moderate pressures are needed for satisfactory operation of porous hose irrigation lines, it is seldom appreciated just how small are the necessary pressures. To obtain specific data on this, three pieces of new porous hose about 2¾ in in diameter were tested under pressure heads of 7 ft and less.

The pieces of hose tested were each 50 ft in length. They had been wetted by submerging in a small stream for at least 16 hr preceding the test. They were then laid on level ground, and a 1-in water meter was used to measure the quantity of water delivered to the hose. Between the water meter and the hose the pipe leading from the meter was increased to 2 in in diameter, and a 2-in tee was inserted. Leading upward from this tee, a glass tube was used to show the height of the column of water which indicated the pressure at the tee, which was not over 8 in from the end of the porous hose. For the higher heads short lengths of pipe were inserted between the tee and the glass tube. The latter arrangement is shown in the accompanying illustration. A second water column was used at the far end. The maximum pressure drop in the 50-ft length proved to be inconsequential. In making these tests the rate of flow was established by adjusting a valve in the supply line; 18 min were allowed to establish equilibrium, and the test was run for 2 min at each pressure.

The following quantities of water oozed out through walls of the hose per 100 ft of length for the pressure heads given:

Head, in feet	Gallons per minute per 100 ft of hose		
	8-ounce, untreated	8-ounce waterproofed	12-ounce untreated
3	5.0	1.8	.5
4	8.2	3.4	1.0
5	15.4	6.0	1.7
6	25.5	10.3	2.4
7	38.0	16.5	3.2

These tests were made by the Bureau of Agricultural Engineering, U. S. Department of Agriculture.

[1]Associate drainage engineer, U. S. Department of Agriculture. Mem. ASAE.

Soil Erosion Control Work by the CCC

By H. J. Stockwell[1]

THE STATE OF ILLINOIS even with all its rich farming land is as outstanding for widespread soil erosion as any state in the union. Bordering and running through it are large rivers which flow through hill regions having steep slopes. The type of soil in these regions is highly erosive.

The control of gullies as far as most landowners are concerned is not much of a problem in their own minds. Other problems of farming take most of their attention and erosion control seems of minor consequence. It is usually considered impossible or too costly to control or reclaim gullies. However, some farmers are trying to do so, and with the aid of their state agricultural experiment stations and extension services are employing methods of gully control. The Civilian Conservation Corps was a means of making definite advance in the practice of gully control and also to show the farmers what could be done.

In April 1933 and the succeeding few months, when Emergency Conservation Work was being initiated, little was accomplished, since camps had to be constructed, supervisory and enrolled personnel had to be trained, and equipment and experience for the administration of the work had to be acquired. Since then real progress has been made, always with increasing efficiency. One look at the plat book of a county, in which this work is being carried on, will show a number of farms in each township with control measures complete and many more on which work is contemplated in the near future. While there is much more to be done, the fact is that the work done is a sizable amount and not just a drop in the bucket.

The supervision of ECW camps is under the Forest Service of the U. S. Department of Agriculture. In each state there is a state director which supervises the camps in that state. Next in line is the camp superintendent who is assisted by a number of foremen. These foremen are technically trained and are each responsible for a crew in the field in addition to other duties.

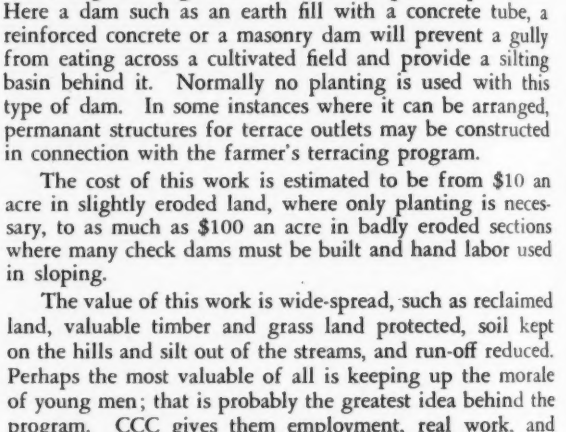
These projects are conducted on privately owned farms. Naturally some sort of a written agreement must be made with the landowner to protect the government and himself. The main reason for these agreements is to have a definite understanding as to the duties of each party of the agreement. The duties of the landowner, known as the cooperator, include protection of the work for an assigned number of years; furnishing fencing material for the project if needed, repair the structures when feasible, furnish teams and material in the form of brush, posts, straw, sod, and in some cases lumber, slabs, cement, sand, gravel, and rock. Also he must furnish the land without cost to the government. The government furnishes labor, transportation, supervision, and part of the materials as set forth in the agreement. There are numerous smaller items that either party may contribute according to their convenience. An interested cooperator can help make an erosion control project very successful and inexpensive. A disinterested cooperator will likely have the opposite effect. Farmers are becoming more interested and are beginning to see the value of this work.

There are two or possibly three types of erosion control work being done by the CCC, permanent and temporary. Terrace outlets are sometimes built which may be considered permanent. Temporary work is done in connection with reforestation and revegetation. Small check dams of slabs, woven wire, brush, loose rock, and possibly other types are placed in the gully to control the slope of the bottom of the gully and hold the soil sloped from the banks. Then the banks are sloped. Plowing in the gullies is the usual practice. Sometimes hand labor must be used. In large, deep gullies where the banks are vertical, dynamite is the most economical means. Afterwards trees and grasses are planted which are expected to provide protection after the temporary dams have been destroyed. This type of work is limited to small drainage areas and usually on slopes too steep for cultivation. These trees and grasses are protected for a few years from livestock.

Permanent structures are used on agricultural lands where large drainage areas and small slopes are prevalent. Here a dam such as an earth fill with a concrete tube, a reinforced concrete or a masonry dam will prevent a gully from eating across a cultivated field and provide a silting basin behind it. Normally no planting is used with this type of dam. In some instances where it can be arranged, permanant structures for terrace outlets may be constructed in connection with the farmer's terracing program.

The cost of this work is estimated to be from $10 an acre in slightly eroded land, where only planting is necessary, to as much as $100 an acre in badly eroded sections where many check dams must be built and hand labor used in sloping.

The value of this work is wide-spread, such as reclaimed land, valuable timber and grass land protected, soil kept on the hills and silt out of the streams, and run-off reduced. Perhaps the most valuable of all is keeping up the morale of young men; that is probably the greatest idea behind the program. CCC gives them employment, real work, and natural companionship when they need it most. The greatest responsibility of Army and Forest Service officers is to help these young men to have more confidence in themselves and a brighter outlook on life.



Example of soil erosion control structures built on CCC projects. (1) A masonry terrace outlet. (2) Slab dams in gully heads. (3) Slab dams in small gullies

[1]Technical advisor, Emergency Conservation Work. Jun. ASAE.

Theo. Brown Awarded McCormick Medal

THEO. BROWN has been awarded the Cyrus Hall McCormick Gold Medal for 1935. This medal is conferred each year by the American Society of Agricultural Engineers for outstanding scientific achievement in the field of engineering as applied to agriculture.

To say that this award recognizes a lifetime of consistent contribution to the mechanics of agriculture would be premature in its implication. It does take note of a third of a century of continuous, productive devotion to creation of ever-better means for farming operations. It is perhaps the fitting moment for this honor to fall upon Mr. Brown, because the year since the previous award marks the granting of his one-hundredth patent. Of the hundred, ninty-nine are definitely concerned with farm equipment.

THEO. BROWN

Theo. Brown was born in Worcester, Massachusetts, and in 1901 was graduated from the famous Polytechnic Institute located there. Two years later came his first patent, the invention of an end-gate for manure spreaders, the machine which for years was to be improved by a series of his inventions, reaching its climax in 1908 with the beater-on-the-axle construction.

His devotion to this humble machine calls for more than passing mention, for it symbolizes a grasp of the two prime fundamentals of agriculture. One was the conservation of soil resources. The other was conservation of human resources by mitigation of a toilsome, tedious task, recognized as such ever since its mention by Geoffrey Chaucer in the Canterbury Tales. In this development Mr. Brown's main emphasis was on easier loading.

In 1911 he joined Deere and Company as superintendent of the Marseilles Works, where the beater-on-axle idea was further developed and put into production. Incidental thereto came an important step for machinery of that class—enclosed gearing. (Be is noted here that in 1918 Mr. Brown was granted five patents, totalling 26 claims, dealing with oil-bath enclosed gearing for mowers.)

Five years later he was placed in charge of experimental work for the John Deere Plow Works, senior unit of the far-flung Deere organization. That same year, 1916, he built a one-row motor cultivator capable also of other farm work—his initial contribution to the evolution of the general-purpose tractor. The next year, with our entry into the World War, he gave largely of his time and effort to design and production detail of the combat wagon used by the American Expeditionary Forces in France.

His activity in development for the John Deere Plow Works was too great and too varied for citation here. Its impetus is emphasized by his colleagues, and no doubt had much to do with his election in 1923 to the directorate of Deere & Company. Following this the scope of his development work was much broadened, and included more of a research nature. This period also marked the beginning of Mr. Brown's activity, sustained ever since, in intracompany standardization. Dovetailing with general standardization as fostered by the ASAE, it has brought economies in manufacture, in repair distribution, and in field service.

The next great trend discernible in the mass of development guided by Mr. Brown resulted from his recognition that ease, speed, and accuracy in control of attached equipment was essential to the success and efficiency of the general-purpose or row-crop tractor. More and more integration of tractor and tool became apparent in designs put into production by his company, and this was especially apparent in his patents. These have become increasingly farsighted, many of the later ones being at present unavailable but looking to future development.

The nucleus of this correlation was the modern tractor power-lift, on which he began intensive study in 1925, and which in one form reached commercial production in 1928. This and various other designs of power-lift mechanisms are the subjects of several patents which resulted from his pioneering work covering this important development. The hundredth patent, comprising 23 claims, has to do with securing clearance, in the raised position, for cultivator rigs on tractors of low body clearance or short wheelbase.

While the number and significance of his patents rank him as an inventor of note, Mr. Brown's methods and viewpoint are essentially those of the engineer. His thoroughness is reflected by the total, in his patents, of 1328 claims. While visionary in the span of his farsightedness, he combines with it a keen sense of economic worth, and of timeliness in commercial feasibility.

Allied for the greater part of his productive career with the organization which grew from John Deere's invention of the steel plow, Mr. Brown receives the present honor as a memorial to the inventor of the reaper, Cyrus Hall McCormick, through arrangements set up and endowed by a daughter and two sons of the latter, namely, Mrs. Emmons Blaine, Mr. Cyrus H. McCormick, and Mr. Harold F. McCormick. Entrusted to the American Society of Agricultural Engineers for administration, the gold medal is awarded annually, as inscribed thereon, "For Exceptional and Meritorious Engineering Achievement in Agriculture." Formal presentation will occur at the 29th annual meeting of the Society to be held at the University of Georgia, Athens, June 17 to 20.

Known generally as Theo. Brown, the formal signatures on his patent papers reveal that he was christened "Theophilus"—lover of Deity. Without knowledge of his personal tenets, his professional colleagues know him as the embodiment of the principle that love of God expresses itself in love toward mankind. His eminent fairness, his unfailing friendliness, and his ever-smiling good nature, no less than his technical achievement, have won a regard that rejoices in the recognition now bestowed.

The concern for human betterment that found expression in his early inventions is reflected in his attitude as an executive. He recently said:

> "I have endeavored in the experimental work with Deere & Company to develop men. Instead of taking out a large number of patents myself, I have been interested in getting these men to think independently by giving them problems to

(Continued on page 208)

PROVISIONAL PROGRAM

29th Annual Meeting of the American Society of Agricultural Engineers
University of Georgia, Athens - June 17, 18, 19, and 20, 1935

First Day - Monday, June 17

Forenoon Programs (Two) - 9:00 to 12:00

(I) College Division

Presiding: Chairman J. C. Wooley, professor of agricultural engineering, University of Missouri

1 Review of committee work for year by the Chairman

2 PAPER: "A County Agricultural Engineer"—M. L. Nichols, professor of agricultural engineering, Alabama Polytechnic Institute

3 ADDRESS: "What is Expected of the Agricultural Engineering Graduate"—Leonard J. Fletcher, agricultural engineer, Caterpillar Tractor Co.

4 ADDRESS: "Engineered Education"—John T. Wheeler, professor of education, The University of Georgia

(II) National Student Branch

Presiding: President Lester Malkerson (Minnesota '35)

Afternoon Programs (Three) - 2:00 to 5:00

(I) College Division

Presiding: Vice-Chairman R. H. Driftmier, professor of agricultural engineering, University of Georgia

1 PAPER: "The Outlook for Agricultural Engineering Extension"—S. P. Lyle, senior agricultural engineer (extension specialist), Bureau of Agricultural Engineering, U. S. Department of Agriculture

2 ROUND TABLE: "Teaching Agricultural Engineering"—Led by C. O. Reed, professor of agricultural engineering, Ohio State University.

(II) Extension Committee

Presiding: General Chairman R. L. Barden, extension agricultural engineer, Ohio State University

(III) National Student Branch

Presiding: President Lester Malkerson

EVENING PROGRAMS

1 Committee and other group meetings by arrangement

2 Showing of motion picture of TVA development

Second Day - Tuesday, June 18

Forenoon Program - 9:00 to 12:00

Presiding: President Glen W. McCuen

1 Call to Order—R. H. Driftmier, chairman, Committee on Arrangements

2 Address of Welcome—Dr. S. U. Sanford, President, University of Georgia

3 President's Annual Address—Glen W. McCuen, professor and head of the agricultural engineering department, Ohio State University

4 ADDRESS: Dr. M. L. Wilson, Assistant Secretary of Agriculture (tentative)

5 ADDRESS: "The Rural Rehabilitation Program in Georgia"—R. L. Vansant, director, rural rehabilitation division, Georgia Emergency Relief Administration

Afternoon Program - 2:00 to 5:00

Inspection tour of the Sandy Creek Project of the Soil Erosion Service, U. S. Department of Agriculture

Committee and other group meetings by arrangement

EVENING PROGRAMS

Dance, combining square and round dances

Committee and other group meetings by arrangement

Third Day - Wed., June 19

Forenoon Program - 9:00 to 12:00

Presiding: President Glen W. McCuen

1 PAPER: "Attacking Soil Erosion on a Nation-Wide Front"—Hugh H. Bennett, chief, Soil Erosion Service, U. S. Department of Agriculture

2 PAPER: "A National Program of Rural Electrification"—(Speaker to be selected)

3 PAPER: "New Opportunities for Promoting Farm Structures"—K. J. T. Ekblaw, agricultural engineer, American Zinc Institute

4 PAPER: "The Design and Development of a Farm Implement"—Theo. Brown, chief, implement research development, Deere & Company

Afternoon Programs (Four) - 2.00 to 4:00

(I) Land Reclamation Division

Presiding: Chairman Lewis A. Jones, chief, division of drainage investigations, Bureau of Agricultural Engineering, U. S. Department of Agriculture

1 PAPER: "The Tallapoosa County Terracing Program"—F. N. Farrington, county agricultural agent, Tallapoosa County, Alabama

2 PAPER: "The Soil Erosion Control Program of the TVA"—W. M. Landess, assistant director, agricultural division, Tennessee Valley Authority

3 PAPER: "The Soil Erosion Control Program of the SES"—T. B. Chambers, assistant chief engineer, Soil Erosion Service, U. S. Dept. of Agriculture

4 General Discussion on Control of Soil Erosion

(II) Rural Electric Division

Presiding: Chairman E. C. Easter, agricultural engineer, Alabama Power Company

1 PAPER: "History and Progress of Rural Electrification in the United States"—Dr. E. A. White, director CREA

2 PAPER: "Rural Electrification"—J. P. Schaenzer, agricultural and irrigation engineer, National Power Survey, Federal Power Commission

3 PAPER: "Rural Electrification in North Carolina"—D. S. Weaver, professor of agricultural engineering, North Carolina State College

4 PAPER: "Rural Electrification in Alcorn County, Mississippi"—George W. Kable, senior designing engineer, agricultural-industrial division, Tennessee Valley Authority

(III) Farm Structures Division

Presiding: Chairman W. G. Ward, chief, farm section, Federal Housing Administration

SYMPOSIUM: "Farm Fencing"— Led by D. Scoates, professor of agricultural engineering, A. & M. College of Texas

(a) "Some Aspects of the Farm Fence Testing Program" H. W. Riley, professor of agricultural engineering, Cornell University (ASAE report on ASTM fence testing committee)

(b) "Farm Fencing as an Investment"—R. C. Miller, professor of agricultural engineering, Ohio State University

(c) "Fence Problems of Southern Farmers"—W. C. Lassetter, associate editor, "Progressive Farmer"

(d) "Agricultural Engineer's Interest in Good Farm Fencing"—(Speaker to be selected)

(e) General discussion

(IV) Power and Machinery Division

Presiding: Chairman A. W. Lavers, chief engineer, tractor division, Minneapolis-Moline Power Implement Company

1 PAPER: "Digestion Studies of Cattle in Relation to Processing Feedstuffs"—E. A. Silver, research agricultural engineer, Ohio State University

2 PAPER: "Trash Shields for Plows"—R. H. Wileman, research agricultural engineer, Purdue University

Evening Program - 7:00 to 9:00

ASAE ANNUAL DINNER

Toastmaster: (To be selected)

1 Award of the Cyrus Hall McCormick Gold Medal

2 Award of the Farm Equipment Institute trophy to an ASAE Student Branch

3 ADDRESS: (Speaker to be selected)

Fourth Day - Thurs., June 20

ASAE Annual Business Meeting—8:00 to 9:00 A.M.

Forenoon Programs (Four) - 9:00 to 11:00

(I) Land Reclamation Division

Presiding: Vice-Chairman Virgil Overholt, professor of agricultural engineering, Ohio State University

1 PAPER: "Terrace Outlets"—W. D. Ellison, supervising engineer, Soil Erosion Service, U. S. Department of Agriculture

2 PAPER: "Results of Recent Engineering Studies of the Statesville, N. C., Soil Erosion Experiment Station"—F. O. Bartel, engineer, Soil Erosion Service, U. S. Department of Agriculture

3 PAPER: "Experiences in Controlling Erosion by Mechanical Means"—E. R. Raney, extension agricultural engineer, North Carolina Agricultural College, and Donald Christy, engineer, Soil Erosion Service, U. S. Department of Agriculture

4 General Discussion on Control of Soil Erosion

(II) Rural Electric Division

Presiding: Chairman E. C. Easter, agricultural engineer, Alabama Power Company

1 PAPER: "Electrically-Operated Milk Pasteurizer"—Henry Trumbull, treasurer, The Trumbull Electric Company

2 PAPER: "Soil Sterilization"—I. P. Blauser, secretary and field engineer, Ohio Committee on the Relation of Electricity to Agriculture

3 PAPER: "Air Conditioning"—(Speaker to be selected)

4 PAPER: "Rural Electrification and 4-H Clubs"—H. J. Gallagher, assistant professor of agricultural engineering, Michigan State College

(III) Farm Structures Division

Presiding: Vice-Chairman K. J. T. Ekblaw, agricultural engineer, American Zinc Institute

SYMPOSIUM: "New Developments in Farm Housing Design"—Led by W. G. Ward, chief, farm section, Federal Housing Administration

(a) "Interesting New Trends in Farm Housing Design and Construction"—(Speaker to be selected)

(b) "The Modular Type House"—(Speaker to be selected)

(c) "Housing Problems in Rural Rehabilitation Work"—(Speaker to be selected)

(d) General discussion

(IV) Power and Machinery Division

Presiding: Vice-Chairman Frank J. Zink, associate professor of agricultural engineering, Kansas State College

SYMPOSIUM: "Terracing Machinery Design and Development"—Led by M. L. Nichols, professor of agricultural engineering, Alabama Polytechnic Institute

(a) Prepared discussions by

(1) John S. Glass, director of ECW for Kansas

(2) R. W. Baird and V. D. Young, agricultural engineers, Soil Erosion Service, U. S. Department of Agriculture

(3) E. V. Collins, agricultural engineer, Iowa Agricultural Experiment Station

(b) General discussion

Afternoon Programs (Four) - 2:00 to 4:00

(I) Land Reclamation Division

Presiding: Chairman Lewis A. Jones, chief, division of drainage investigations, Bureau of Agricultural Engineering, U. S. Department of Agriculture

1 PAPER: "Capacity of Vertical Drop Culverts of Circular Cross-section"—H. B. Roe, professor in charge of land reclamation, agricultural engineering division, University of Minnesota

2 PAPER: "Drainage of Peat Lands in Florida"—B. S. Clayton, drainage engineer, Bureau of Agricultural Engineering, U. S. Department of Agriculture

3 PAPER: "The Engineering Reorganization of Farms"—N. A. Kessler, agricultural engineer, Bureau of Agricultural Engineering, U. S. Department of Agriculture

4 General Discussion

(II) Rural Electric Division

Presiding: Chairman E. C. Easter, agricultural engineer, Alabama Power Company

1 PAPER: "Rural Electrification and Smith-Hughes Schools"—Clyde Walker, agricultural engineer, Oregon State Agricultural College

2 PAPER: "Irrigation in Florida"—F. D. Banning, rural development engineer, Florida Power & Light Company

3 PAPER: "Sprinkler Irrigation"—F. E. Price, agricultural engineer, Oregon State Agricultural College

4 PAPER: "Electric Service in the Greenhouse"—W. C. Krueger, extension agricultural engineer, Rutgers University

5 Reports of Committees

(III) Farm Structures Division

Presiding: Chairman W. G. Ward

1 PAPER: "Effective Measures for Termite Control"—(Speaker to be selected)

2 Committee Reports

(IV) Power and Machinery Division

Presiding: Chairman A. W. Lavers

1 PAPER: "Research Work in Cotton Ginning"—Chas. A. Bennett, associate mechanical engineer, Bureau of Agricultural Engineering, U. S. Department of Agriculture

2 PAPER: "Recent Developments in the Mechanical Placement of Fertilizers"—G. A. Cumings, agricultural engineer, U. S. Department of Agriculture

3 COMMITTEE REPORTS

EVENING PROGRAM

Entertainment furnished by the Committee on Arrangements

NEWS

Farm Equipment Institute Donates Cup

AS A SPECIAL incentive to the members of student branches of the American Society of Agricultural Engineers, the Farm Equipment Industry of Chicago, a national association representing the leading manufacturers of agricultural equipment in the United States has donated a silver cup. This cup will be awarded each year to that student branch of the Society, which in the opinion of the judges has the most outstanding record of activities and achievements for the year.

At the present time there are fourteen active student branches of the Society located at the following land-grant colleges and universities: University of Georgia, University of Idaho, University of Illinois, Iowa State College, Kansas State College, University of Missouri, University of Nebraska, Ohio State University, Oregon State Agricultural College, Pennsylvania State College, Clemson College, A. & M. College of Texas, Virginia Polytechnic Institute, and State College of Washington. The membership of these branches consists of students who are enrolled in professional agricultural engineering courses, or who are majoring in agricultural engineering subjects. Their activities include the holding of frequent meetings of both a professional and social character, issuing of publications, conducting exhibits, etc., all designed to stimulate interest in the field of agricultural engineering and to bring the students into contact, as much as possible, with the realities of agricultural engineering work which they will face upon leaving school.

A special committee of judges, appointed by the President of ASAE, will decide the winner in the competition for the FEI Cup on the basis of information furnished by each student branch as to its activities and accomplishments during this past school year. The formal award of the Cup will be made by President Glen W. McCuen of the American Society of Agricultural Engineers at the annual dinner of the Society during its 29th annual meeting at the University of Georgia at Athens, June 17 to 20, and it is expected that the winning branch will have a member representative at the dinner to receive it. Permanent possession of the cup will be given any ASAE student branch winning the trophy three years in succession.

The Farm Equipment Institute Cup to be awarded to ASAE Student Branches

AEC Washington News-Letter

THE following items, of particular interest to agricultural engineers, have been gleaned from a news release dated April 15 from American Engineering Council:

The great $4,880,000,000 work-relief bill has been enacted. To engineers, this measure brings deep responsibilities for, without engineering technique, such a program could neither be planned nor executed. It brings complex problems of professional status and of adjustment to new lines of activity. But most of all, the program brings hope to thousands of engineers now losing their skill in idleness or in makeshift jobs.

The engineering nature of the program becomes evident from the type of projects earmarked in the bill. The $4,880,000,000 represents an appropriation of 4 billions plus the release of approximately 880 millions from past appropriations. The latter sum is mainly for continuance of relief through June 30 and for repayment of PWA funds temporarily used for relief while passage of the bill hung fire. Allocation of the 4 billions follows:

Highways; road; grade crossings	$800 millions
Rural rehabilitation and relief in stricken areas; water conservation; trans-mountain water diversion; irrigation; reclamation	500 millions
Rural electrification	100 millions
Housing	450 millions
Assistance for educational, professional and clerical persons	300 millions
Civilian Conservation Corps	600 millions
Loans and grants to states, municipalities, etc., not less than 25% of each loan or grant for work	900 millions
Sanitation; prevention of soil erosion; prevention of stream pollution; sea coast erosion; reforestation; flood control; rivers and harbors; miscellaneous	350 millions
Total	$4,000 millions

Not to exceed 20 per cent of the 4 billions may be used to increase any one or more of the above items. This listing may be somewhat misleading in that it represents classes of work rather than functional divisions of the program. Any given item may be split between several operating agencies of the government.

General policies remain much as set in the President's first message to this Congress, giving preference to useful projects employing a high ratio of direct labor with some prospect of self-liquidating. Wages are to be more than doles; less than regular pay scales—the security wage idea. Competition with private industry is to be avoided. A shift of employables from cash relief into work relief projects will be undertaken as speedily as possible, focusing on the centers of unemployment, so that work relief will be raised from a present total of 2½ millions to 3½ million persons, while unemployables are thrown to the states. The hope is to carry through until private employment, stimulated perhaps by indirect effects of the program, takes up the load.

American Engineering Council, representatives of its member societies, and allied groups are actively negotiating in Washington with regard to the engineers' part in the vast program.

Rural electrification plans were advanced by a delegation from the American Society of Agricultural Engineers in Washington recently. The group, headed by Glen W. McCuen, president of ASAE, called upon Dr. Tugwell and other prominent officials who will be influential in the rural work. They offered the services of ASAE to help the program in a constructive way.

The new assistant secretary of AEC is L. V. Reese who was handling rural-industrial communities for FERA before coming with Council. Previously he was executive secretary, District of Columbia Rehabilitation Corporation and was planning engineer, Texas Relief Commission. His federal background and contacts will be valuable in securing recognition of engineers in the work-relief program. He will serve as a liaison officer between the federal agencies and the member groups of Council; also will take charge of developing Council's committee work, especially through the new system of public affairs committees designed to advance the position of organized engineers in public matters of moment to the profession. Mr. Reese, who is 43, was educated in civil engineering at the University of Texas and in mechanical, metallurgical, and industrial engineering at Columbia and New York universities. His experience in engineering and executive capacities has been extensive. Prior to his federal work, he was engaged in public utility, construction, and industrial undertakings.

The new plan of organization for Council's regular and standing committees for 1935 has been completed. A report, which outlines the functions of each committee and lists the personnel, is available on request; is being mailed to member organizations and to committee members.

Council membership is gaining under the new plan of nominal dues for state and local societies. In addition to those noted last month, the Arkansas Engineers Club, Cleveland Engineering Society, Michigan

Engineering Society, and Providence Engineering Society have made application.

Nine functional units serving the engineering profession as a whole are to hold a joint meeting at the Engineers Club, New York, May 20, to bring their objectives into closer coordination. These organizations are: United Engineering Trustees, Inc.; Engineering Societies Library; Engineering Foundation; American Standards Association; Division of Engineering and Industrial Research, National Research Council; Engineering Societies Employment Service; Engineers' National Relief Fund; Engineers Council for Professional Development, and American Engineering Council. Charts and exhibits showing the nature of each unit, its work, and its publications will be on display so that each group may be fully informed as to the activities of the others.

The student selection and guidance phase of the Engineers Council for Professional Development has become operative with the purpose of aiding students in secondary schools to form contacts with engineers and learn more about the profession. In this way, misfits may be weeded out and young men of ability encouraged to go on. A booklet, "Engineering, a Career—a Culture," is available at 15 cents per copy from the Secretary of ECPD, 29 West 39th Street, New York. Another phase, accrediting of engineering colleges, is under way as previously announced. The other two functions of ECPD are professional training and professional recognition—encouraging the young graduate to appraise himself and to continue his studies until he becomes a full-fledged engineer.

The engineering index, which records technical progress as reported by the engineering and allied scientific journals of this country and abroad, has had hard going through the depression and is in the hands of a committee, of which Mr. Feiker is a member, working toward the continued usefulness of this service. Efforts are being made to bring in the support of private industries to whom the index fills an important need.

The Patent Committee of AEC has declared in general opposition to the Sirovich Bill for regulation of patent pools and agreements.

Coordination of existing national societies rather than the forming of new ones is the need of the profession, according to Professor H. O. Croft, head of the mechanical engineering department, University of Iowa, speaking before the Iowa Engineering Society. Professor Croft has cited the familiar examples of professional solidarity shown by the American Medical Association and the American Bar Association. In so doing, he has carried this line of comparison rather more deeply than any other commentator we know of. He has drawn charts of the organization and growth of these associations as compared to the scattered organizations of engineers. His principal observation is that the medical and legal units balance professional interest with technical interest. Our older societies, he points out, have worked more on the technical side. The answer, he believes, is to expand the field of professional interest rather than to create a new group which is wholly professional and does not cover technique. As to coordination, there are more than 90 alphabetical agencies within the engineering profession as compared to 65 in the New Deal government. So it is up to the engineer to simplify his own "alphabetical porridge."

Write the Spanish Embassy

THE following information relative to the Second International Congress of Rural Engineering which will be held at Madrid, Spain, September 26 to October 3, 1935, will be of interest to agricultural engineers and others in the United States who plan to attend the Congress.

From word just received from Mr. E. Aranda Heredia, secretary of the Congress, the Spanish government has sent the various countries an official invitation to send delegates to Spain to attend this Congress, and for any information desired by those who wish to attend the Congress, arrangements have been made for Mr. Miguel Echegaray, agricultural attache to the Spanish Embassy at Washington, D. C., to answer all such inquiries in the United States.

Elections to College Group

IN THE recent election of two members to serve two years each as members of the Advisory Committee of the College Division of the American Society of Agricultural Engineers, E. G. McKibben, associate professor of agricultural engineering, Iowa State College, and C. O. Reed, professor of agricultural engineering, Ohio State University, were elected to the Committee, and will begin their terms following the annual meeting of the Society this coming June. Other members of the Committee for the ensuing year are R. L. Patty, professor of agricultural engineering, South Dakota State College, and Hobart Beresford, professor of agricultural engineering, University of Idaho. The chairman of the Committee for next year will be R. H. Driftmier, professor of agricultural engineering, University of Georgia, Athens.

NECROLOGY

FRED J. BULLOCK, a member of the American Society of Agricultural Engineers since 1922, and one of the organizers of the North Atlantic Section of the Society, passed away April 16. Mr. Bullock was born on a farm near Emporia, Kansas, and moved to western New York as a small boy. He was educated at the Genesee Wesleyan Seminary, and his early work was the rebuilding of threshing machines and steam traction engines in a small machine shop at Lima, New York. Later he worked for the newly organized Papec Machine Company, and for two years was engaged as machinist by the Browning Engineering Company of Cleveland, but returned in 1903 to associate himself permanently with the Papec Company, of which he was a director, vice-president, and chief engineer at the time of his passing.

Mr. Bullock was closely associated with the development of power-driven farm machinery since the beginning of the century, and invented, perfected, and patented many mechanical devices, especially in the field of feed-processing and handling equipment. In 1915 he suggested and made practical, through machine design, the chopper method of storing the hay crop which is receiving considerable attention at the present time. He was widely consulted in this country and abroad on matters of agricultural implement design and livestock feeding methods. He was a contributor to technical journals, an excellent lecturer, and a leader in community, church, and lodge affairs. He was a man of unbounded interest in human as well as mechanical problems, and his practical contributions to the solution of both will long survive him.

A Survey of the Engineering Profession

IT IS generally admitted that the professional engineer has suffered acutely since 1930.

What can be done to help him? Obviously, nothing can be done without facts. These facts are now being sought by the questionnaire method.

Probably early in March, a questionnaire will be forwarded to thousands of men in the United States who think of themselves as engineers, from sub-professional men and recent graduates to chief engineers and consultants. It will be sent to civil, mechanical, electrical, mining, and chemical engineers—to those in all of the many branches of engineering. This project is being undertaken by the U. S. Bureau of Labor Statistics at the request, and with the cooperation of the American Engineering Council and the several engineering societies. More than 170,000 questionnaires are to be sent out to engineers in all parts of the country.

The objects of the survey are to determine the factors which contribute to tenure of employment and compensation, degree of unemployment, and sources of reemployment; to throw light on the influence of education or place of employment upon compensation, to investigate the relationship of engineering employment to that in other professions. Education, years of experience, types of work, place of practice, nature of previous employment (whether continuously in one organization or in one type of work or scattered among several), membership in professional or technical societies, registration in states that require it, salaries received in the past, typical duties, and special qualifications—all these elements and many others may have a definite bearing on the present condition of the engineer.

To make the survey as comprehensive and as useful as possible, the form of the questionnaire has been worked out by Dr. Isador Lubin of the Bureau of Labor Statistics with the aid of members of the several engineering societies, selected for their experience in employment studies. The bureau is to print and mail the questionnaires, receive and analyze the returns, and publish the results. The answers will be punched on tabulating cards and fed through sorting machines. Thus the splendid clerical and mechanical facilities of the Bureau of Labor Statistics and the use of its franking privilege will eliminate any large direct expenditure.

One thing the bureau cannot do, however, is to obtain and prepare the mailing list. On behalf of the American Engineering Council, the American Society of Civil Engineers has furnished space, the time of staff assistants, and the incidental expenses for correspondence and postage to obtain and prepare these lists. What is necessary is a file of names and addresses, stenciled or typed on 3-by-5-in cards, sorted by states, and arranged alphabetically, with obvious duplicates laid aside.

Securing the cards has been no small task. Requests were sent to 233 engineering societies, associations, and clubs; to 32 state registration boards; and to 156 engineering schools, asking that cards be pre-

pared and sent to ASCE headquarters. In the case of the engineering schools, data concerning graduates of the last five years only were requested. When it is realized that 203,000 cards have been received, it is obvious why cards were needed instead of lists or year books.

The 1930 Census indicated that 226,136 persons in the United States considered themselves engineers. Elimination of duplicates in the cards received have reduced their net total to 170,000, or about 75 per cent of the census total for 1930, a surprisingly large sampling of the profession. This remarkable response is extremely gratifying. It indicates the intense interest of engineers in their own welfare.

To solicit, collect, and acknowledge the cards required the time of two members of the ASCE staff for almost six weeks. To sort and arrange the cards at ASCE headquarters, 12 specially qualified women chosen from the unemployment relief rolls of New York were assigned. The time of these workers for 1,105 hr and the time of various staff members for 392 hr has been devoted to the task.

There will still remain some engineers who do not belong to any organization. Since it is the hope to send a questionnaire to every engineer in the country, it will help if any person who knows of an unaffiliated engineer will send his name and address on a 3-by-5-in card direct to Dr. Isador Lubin, Bureau of Labor Statistics, Department of Commerce, Washington, D. C., so that it may be placed in the card file now there.

In addition, names and addresses are greatly desired for those former members or organizations who have had to drop out within the last few years for financial reasons. Such men, having borne the brunt of the economic slump, most certainly should receive questionnaires.

Questionnaires will be kept absolutely confidential, and need not be signed by the individual returning them. No person connected with the work is interested in the individual returns. It is certain, however, that large numbers of engineers will be interested in the published results of the analysis. Each individual engineer will realize that this nation-wide survey will result in a satisfactory analysis only if he fills out his report completely and sends it in promptly.—Abstracted from *Civil Engineering* for March 1935.

New ASAE Members

Ralph J. Blair, agricultural engineer, Virginia Electric and Power Company, Norfolk, Va.

John R. Carreker, agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Dadeville, Ala.

Louis B. Earle, technical foreman, ECW, and Soil Erosion Service, U. S. Department of Agriculture. (Mail) Correll Hotel, Mankato, Kans.

William V. Harlin, junior agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Dadeville, Ala.

Monroe A. Hartman, junior agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) 717 N. 5th St., Temple, Texas.

James A. Muncey, acting chief agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) High Point, N. C.

H. R. Murphy, assistant manager, agricultural sales division, Caterpillar Tractor Co., Peoria, Ill. (Mail) 302 Hettinger Place.

Charles M. Sanders, junior agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Dadeville, Ala.

Wm. A. Weld, assistant agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Greensboro, N.C.

TRANSFER OF GRADE

Robert B. Hickok, assistant agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Zanesville, Ohio. (Junior to Associate Member)

Applicants for Membership

The following is a list of applicants for membership in the American Society of Agricultural Engineers received since the publication of the April issue of AGRICULTURAL ENGINEERING. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

Woodrow M. Brown, junior agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) RFD 1, High Point, N. C.

William P. Elam, agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Box 882, High Point, N. C.

Walter M. Floto, manager, fence and post sales department, American Steel and Wire Co., 208 S. LaSalle St., Chicago, Ill.

Theodore R. Horning, junior agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) 217 N. Almon St., Moscow, Idaho.

B. M. Lakshmipathy, estate mechanical engineer and lecturer, Agricultural College, Lawley Road P. O., Coimbatore, India.

Archie A. Langley, assistant terracer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Hertzog Apartments, Spartanburg, S. C.

Stephen J. Mech, junior agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Lindale, Tex.

George C. Merkel, junior agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) 1235 S. 15th St., Bethany, Mo.

R. L. Mohler, staff member, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Box 882, High Point, N. C.

Dwight D. Smith, assistant agricultural engineer, Soil Erosion Service, U. S. Department of Agriculture. (Mail) Bethany, Mo.

Clark P. Spellman, director, rural service, Virginia Electric & Power Company, Richmond, Va. (Mail) Box 1194.

TRANSFER OF GRADE

H. F. McColly, head, department of agricultural engineering, North Dakota Agricultural College, Fargo, N. D. (Associate Member to Member)

STUDENT ACTIVITIES

Contributed and edited by members of ASAE student branches

A Message to Student Branch Members

By Lester Malkerson (Minn. '35)

President, National Student Branch of ASAE

IT WILL not be long until many of you students will be graduating from your various colleges. Your future from then on is in your hands. What you want to do with it is left to you.

Being human and young, we are ambitious and are desirous of earning a profitable livelihood. No doubt this is the aim of every student. Some students have located employment. Others have not. With this in mind, I would like to suggest that all graduating students attend the ASAE annual meeting at Athens, June 17 to 20. At that time every student will have the opportunity to contact many prospective employers.

At the present time the farm equipment industry is booming. Production is at a maximum, and there is a demand for employees that have the necessary prerequisites. Employers attending the meeting will be looking for new men. Why don't you make the most of this opportunity and attend.

I have received letters from men that are prominent in the farm equipment industry stating that the college graduate does not know how to apply for a job. One man wrote, "Not one graduate in ten knows how to apply for a job. It seems to me that the individual must carry most of the responsibility in seeking employment." This statement is a challenge to you. Why not accept it? Come to the meeting; sell yourself to these men. Show them that you are at least interested enough in agricultural engineering to attend the meeting.

As was stated before in the students' section of AGRICULTURAL ENGINEERING the more favorable contacts a young man can make, the greater will his chance for a successful career be.

Besides the benefits already mentioned, there are those derived from the program. This year the student group is sponsoring its own program. The program has been drawn up in a manner that will be of great interest to the students.

There will be approximately ten men on the program. Each man is well known and respected by his fellow workers. Each man is an authority in his particular field. His word carries weight. These talks will be on subjects that are of interest to the students and will be educational as well. The talks will be very informal. After each talk, the students will be given the opportunity of asking the speaker questions relative to his topic.

The following is the list of speakers, including the subjects of their talks, who have accepted our invitation to talk to our group:

1 Glen W. McCuen, president of ASAE (An address of welcome)

2 Fred A. Wirt, advertising manager, J. I. Case Company ("Opportunities in Selling Farm Equipment")

3 Arthur W. Turner, advertising department, International Harvester Co. ("What Industrial Concerns Expect of Graduates")

4 Charles P. Tobin, farm department, The Celotex Company ("A Few Building Facts on Temperature Control")

(Continued on page 206)

3,000,000

"CATERPILLAR" DIESEL HOURS

(in the 5 Pacific Coast States alone)

CONFIRM ITS COMPLETE ECONOMY!

Driven by an unskilled Mexican boy who had never even see a Diesel before, the 40-hp. "Caterpillar" Diesel Tractor pictured below has done 5500 hours of heavy-duty farm work—on an average repair expense of *less than a penny per hour.* And fuel cost over this long operating period averaged only 8¼ cents per hour! . . . Another large ranch, with 17,000 hours of "Caterpillar" Diesel Tractor experience, reports that the 40-hp. machines *cost less to operate than a 3-plow gasoline tractor.*

In the Pacific coast states alone, "Caterpillar" Diesel owners have amassed more than 3,000,000 operating hours of experience. . . . Of the more than 5,000 "Caterpillar" Diesels sold in America and in 58 other countries, in not one single instance known has a user returned to a gasoline powered tractor.

Caterpillar Tractor Co. pioneered the quest for Diesel tractor economy a decade ago. This company introduced the Diesel-powered tractor in 1931—and for almost two years, was the only manufacturer to offer the choice of Diesel or gasoline powered tractors. And ever since the first farmer bought a "Caterpillar" Diesel Tractor, the evidence of complete economy has been piling up.

The "Caterpillar" Diesel Tractor — a balanced unit combining the unmatched advantages of the chassis built to "Caterpillar" quality standards, and the Diesel Engine developed to power it — is delivering such net and sustained savings as have never before been recorded!

CATERPILLAR TRACTOR CO. PEORIA, ILLINOIS

40-hp. "Caterpillar" Diesel Tractor deep-plowing 1½-2 acres per hour with five 14-inch bottoms. Owner: Central Produce Company, Guadalupe, California.

Request the new illustrated booklet: "'Caterpillar' Diesel on the Farm."

Agricultural Engineering Digest

A review of current literature by R. W. TRULLINGER, senior agricultural engineer, Office of Experiment Stations, U. S. Department of Agriculture.

PHOTOGRAPHIC STUDY OF COMBUSTION IN COMPRESSION-IGNITION ENGINE, *A. M. Rothrock*. SAE (Soc. of Automotive Engin.) Journ., 34 (1934), no. 6, pp. 203-210, figs. 7. This combustion study was made in a high-speed compression-ignition engine. A high-speed motion picture camera and an optical indicator were used to take motion pictures of the flame travel and the pressure development during combustion in the National Advisory Committee for Aeronautics combustion apparatus. Tests were made in which both the injection-advance angle and the engine-coolant temperature were varied. The results show that in a compression-ignition engine with a quiescent combustion chamber the flame first appears in the spray envelope and from there spreads to other parts of the chamber. The course of the combustion is controlled by the temperature and pressure of the air in the chamber from the time at which the fuel is injected until the time at which combustion starts.

The conclusion is presented that in a compression-ignition engine the ignition lag should be decreased to the largest value that can be used without excessive rate of pressure rise. Any further decrease in this lag decreases the combustion efficiency of the engine.

DATA ON STRUCTURAL USE OF PLYWOOD FROM TWO NEW TEST SERIES, *G. W. Trayer*. Engin. News-Rec., 113 (1934), no. 6, pp. 172-176, figs. 5. Two series of tests completed at the USDA Forest Products Laboratory furnish new data on the use of plywood, particularly from a structural viewpoint. In the first tests the action of plywood when utilized as a structural covering for frame walls and wall units was studied, while the second investigation covered floor panels with stressed plywood coverings.

The results of both tests are significant. Briefly, for wall units, well-nailed plywood in large sheets was shown to contribute strength and rigidity comparable to that obtainable with diagonal lumber sheathing and much greater than that obtained with horizontal sheathing. By gluing the plywood instead of nailing it, strength and rigidity may be increased enormously.

In the floor-panel tests unusual advantages were demonstrated for units using plywood nailed and glued to the top of the joists as a subfloor and to the bottom of the joists as a ceiling. Such construction permits the plywood to contribute to the flexural strength of the floor system, and in effect reproduces the action of a box girder. Shallower joists are permissible, and greater stiffness and strength are obtainable with stressed plywood coverings.

THRESHER AND OTHER MECHANICAL INJURY TO SEED BEANS OF THE LIMA TYPE, *R. Bainer* and *H. A. Borthwick*. California Sta. Bul. 580 (1934), pp. 30, figs. 13. Studies are reported which showed that peripheral velocity of the thresher cylinder is a more satisfactory basis than speed of rotation for comparing the effects of cylinders having different diameters and operating at different speeds. Cylinder speed and percentage of damage are directly related—the greater the speed, the greater the damage. Total damage to a lot of baby lima beans containing 9.1 per cent moisture varied from 7.6 to 52.5 per cent at threshing speeds of from 770 to 1,560 fpm (feet per minute). A lot of baby lima beans containing 16.4 per cent moisture showed 1.0 to 21.0 per cent damage, despectively, at cylinder speeds of 770 and 1,785 fpm. High moisture content in the beans permits higher cylinder speeds to be used without an increase in the total damage. The cylinder speeds required to produce 15.0 per cent total damage in Fordhook beans containing 15.9, 17.3, and 18.8 per cent moisture were 1,150, 1,330, and 1,600 fpm, respectively. A thresher having only one cylinder is not suitable for seed beans because the speed necessary for thoroughness is too high for the production of damage-free seed. A low speed on the first cylinder of a two or three-cylinder machine usually insures the threshing of a high percentage of the crop with a minimum of damage. If speed on successive cylinders is increased, the threshing can be completed without damaging a high percentage of the seed.

More damage apparently occurs during light feeding of the threshing machine than during ordinary or heavy feeding. For example, the total damage to Fordhook beans containing 14.6 per cent moisture amounted to 11.4, 8.6, and 7.4 per cent, respectively, for light, ordinary, and heavy feeding. Fordhood beans carefully threshed with the ordinary disk harrow set straight showed only 1.2 per cent total damage. The total damage to four lots of baby lima beans threshed by rolling varied from 2.6 to 38.1 per cent.

According to laboratory tests in which beans of various moisture contents were subjected to impacts of equal intensity by dropping them known distances, beans of high moisture content receive less damage than beans of low moisture content. The results agree with those obtained from threshing tests in the field. Moisture content is of fundamental importance in the threshing of seed beans. Although uncontrollable, it is nevertheless an important guide in determining how high a cylinder speed may be used with safety.

The fast-moving, cup-type elevators and the steep slides found in bean warehouses are the most likely points where damage to seed beans during handling may occur. Beans of 10.6 per cent moisture content rolled down a 45-deg slide showed total damage of approximately 4.5, 8.6, and 15.3 per cent, respectively, for slide distances of 6.4, 10.5, and 15.0 ft. Comparative tests showed that neither the plate nor the pick-up type of planter produces any appreciable amount of damage.

TRACTOR REPAIR AND MAINTENANCE, *R. I. Shawl*. Illinois Sta. Circ. 425 (1934), pp. 48, figs. 28. The purpose of this circular is to supplement the information given in the instruction books on the repair and maintenance of tractors. It contains a large amount of information on tractor repair and overhaul and includes a classified list of items which should be considered in that connection.

STORAGE FOR THE FARM HOME, *M. Fitzgerald* and *C. V. Phagan*. Okla. Agr. Col. Ext. Circ. 312 (1934), pp. 12, figs. 13. Practical information on working drawings are given for fruit, vegetable, fuel, tool, and other types of storages.

CONDENSATION OF MOISTURE IN FLUES, *W. R. Morgan*. Ill. Engin. Expt. Sta. Circ. 22 (1934), pp. 22, figs. 9. The moisture content of flue gases resulting from the combustion of anthracite, semibituminous, and bituminous coals, oil, natural gas, and manufactured gas were calculated for a total of twenty-three individual fuels. The condensation to be expected with anthracite and soft coal and with manufactured gas was computed, using the calculated average moisture content of the flue gases for each type of fuel and the experimentally determined flue-gas temperatures for a wide range of firing rates. From these data the saturation temperatures of the flue gases and the amount of condensation at normal chimney temperatures for such fuels have been determined.

It is evident that for any given firing rate and flue-gas temperature, condensation is highest for the fuel having the highest dew point and lowest for the fuel having the lowest dew point.

In studies of an actual installation it was found that no condensation occurs with anthracite because the temperature of the flue gases is never below the dew point. A small amount of condensation may occur with soft or bituminous coal at low firing rates. Extremely heavy condensation occurs with manufactured gas but under distinctly different conditions than with coal. With gas, a maximum condensation of about 6.75 lb per hour occurs with a firing rate of 84,000 Btu per hour, corresponding to an outdoor temperature of approximately 15 deg F. The maximum condensation for soft coal occurs in mild weather, while for the gas the maximum condensation, approximately eighteen times the maximum for soft coal, occurs when the outdoor temperature is about 15 deg above zero.

Because of the less severe temperature conditions in the flue when gas is used as fuel, vitrified impermeable liners, provided possibly with sockets, could be used without much danger of breakage or disintegration. Such liners would eliminate seepage, and for this reason it would be necessary to make provision for drainage of the condensate from the chimney.

An appendix describes the methods of calculation used in the study.

SEEPAGE OF GROUNDWATER AND ITS RELATION TO ALKALI ACCUMULATION, *D. S. Jennings, W. Gardner*, and *O. W. Israelsen*. Utah. Sta. Circ. 106 (1934), pp. 12, figs. 3. A general discussion of the manner of accumulation of alkali in valleys is followed by a brief summary of detailed studies conducted in Cache Valley, Utah. These indicated that pumping of substantial quantities of irrigation water from ground water sources will decrease both evaporation and deposition of salts.

er cent.
ous mois-
by drop-
nt receive
ults agree
Moisture
of seed
important
be used

es found
mage to
per cent
damage
for slide
ved that
ices any

nois Sta.
rcular is
ooks on
amount
a clas-
nection.

V. Pha-
3. Prac-
t, vege-

an. Ill.
noisture
thracite,
manu-
dividual
nd soft
lculated
of fuel
a wide
eratures
l chim-

temper-
est dew

conden-
the flue
ndensa-
g rates.
gas but
gas, a
with a
utdoor
ndensa-
gas the
cimum
15 deg

e flue
ovided
ger of
epage,
on for

in the

LKALI
elien.
tion of
by a
Utah.
gation
ration

Use THE TERRACER DESIGNED FOR . . .

High Bank Cutting

TEARS DOWN BENCHES 25-50% FASTER

NOW you can knock down old bench terraces in far less time. Experience in the Piedmont section shows that the Allis-Chalmers Terracer destroys benches up to 50 per cent faster than has ever before been possible.

Only the Allis-Chalmers Terracer has this High Bank Cutting advantage. Without stopping the tractor for changes or adjustments, the moldboard can be placed in high bank cutting position . . . to pull down old terraces 3 to 5 feet high. A side shift of 40 inches in the circle assembly provides long blade reach outside the wheels . . . another definite advantage in undercutting old terraces.

For building new terraces, too . . . advanced A-C design saves time and trouble. Exclusive wide frame permits blade lift cranks to turn in complete circle . . . also increases stability on steep slopes. Same all-bolted construction as A-C tractors and graders. Alloy bolts in fitted holes with double thickness nuts. Heavy draft spring hitch affords protection against shocks. Ball and socket connections have provision for taking up wear. Write for descriptive folder.

Companion unit to the Allis-Chalmers Model "K-O" Oil Tractor—48 Drawbar H.P. . . . Hillside or Standard Tread.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

Student Activities

(Continued from page 200)

5 Hugh R. Roberts, Portland Cement Association ("Concrete Work on the Farm")

6 Leonard J. Fletcher, manager, agricultural sales, Caterpillar Tractor Co. ("How to Apply for a Job")

7 E. A. Easter, chairman, Rural Electric Division, ASAE ("How Should an Agricultural Engineering Student Prepare Himself for Work in Rural Electrification")

8 R. H. Driftmier, head, department of agricultural engineering, University of Georgia ("Some Things the Young Agricultural Engineer Needs to Know")

Besides the student program, the Society is sponsoring a large program that will be of interest to the students. The topics on this program will be worthwhile for the undergraduates as well as for the graduating agricultural engineers.

We are working out a program of entertainment for the students. We assure you that there will not be a dull moment the entire time of your visit at the meeting. Dan Norton, local general arrangements chairman at Athens, is making arrangements for economical board and lodging. He says that there is a lot of Southern hospitality in Athens.

If you can possibly make arrangements, come! We extend you a cordial invitation and we will do our best to make your trip to the meeting a memorable one. Start planning now. See how easy it will be to get several of the fellows to go with you. This will enable you to cut your traveling expenses, and give you company on the trip.

News from VPI Branch

RECENT activities of the VPI Student Branch of the ASAE have consisted chiefly of talks given by members of the Branch. Many interesting topics have been discussed at the meetings. On March 28 the group met to discuss the program for the third quarter. Since talks have been given by juniors and seniors in the branch.

The election of officers for the ensuing year was held April 18. The officers elected were J. J. Bass, president; J. B. Burgess, vice-president; G. C. Vaughan, secretary, treasurer. and W. B. L. Hutcheson, scribe. At the same meeting it was announced that a smoker would be held at the last regular meeting of the school year. Also, talks will be given by two members of the college faculty in the near future.—J. L. Calhoun, scribe.

No Registration Fee

THE ASAE Secretary's office is notified by the committee on arrangements for the annual meeting of the Society at the University of Georgia, Athens, in June, that bona fide members of student branches of the Society will be exempt from the payment of the $2.00 registration fee at the meeting. It will be necessary, however, for each student in registering to show his membership card to those in charge of registration. (This refers to the membership cards recently sent to each branch from the Secretary's office, through the courtesy of the Oregon Student Branch.)

News of the Georgia Branch

MR. W. VAN HAITSMA of the Boeing School of Aeronautics visited the Georgia Student Branch of ASAE and gave a short talk on the development and future of aviation. He followed up this talk by a series of moving pictures on the subject. The meeting was attended by Coach Stegeman, dean of men at the University of Georgia. Coach Stegeman and Mr. Van Haistma were boyhood pals in the days of the old swimmin' hole.

Mr. H. H. White of the James Leffel Company, of Atlanta, Georgia, talked to the Georgia Branch on the development of waterpower for farm use. Accompanying Mr. White to the meeting was Mr. Wilcox, of Atlanta, who told the club that he was a relative of Major Cook who established the confederate gun factory at Athens.

Mr. W. E. Conklin, architect, spoke at the next meeting on "Modern Trends in Agricultural Building." Professor R. H. Driftmier awarded two honor keys for outstanding work done by H. C. Seaton and T. R. Seaton in promoting the welfare of the Georgia Branch of ASAE.

The sixth annual publication of the "Georgia Ag. Engineer" is just off the press. The annual is larger this year with the circulation doubled. Lester Malkerson, the national president of the Student Ag. Engineers, is being sent 25 copies to mail to all the branches.

Ohio Student Branch Reports

OFFICERS of the Ohio State Student Branch of ASAE have been elected for the coming year, as follows: Glenn Foltz, president; Harris Gitlin, vice-president; Paul Rofkar, secretary-treasurer; Paul Allen, sergeant-at-arms; and Mr. E. A. Silver, faculty counselor.

Plans are now moving forward for a banquet to be held some time in May. The new officers will be installed at this meeting.

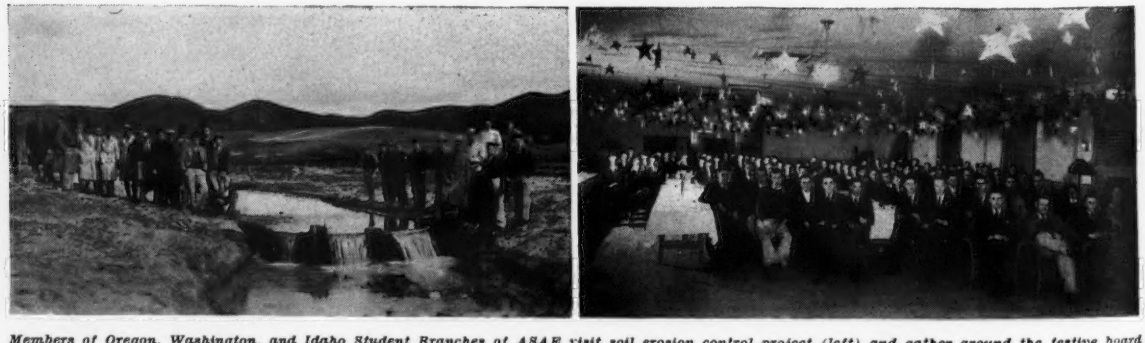
Other activities for the remainder of the quarter will be to make an inspection trip to Zanesville, Ohio, to visit the federal soil erosion control experiment farm there. Also the Branch will furnish a program for high school students that will be on the campus two days this spring, May 31 and June 1. Usually 2500 or more are present at that time. This makes a wonderful opportunity to contact these young men and not only interest them in the University, but in the field of agricultural engineering as well.

Three N.W. Student Branches Meet at Moscow

DURING March, the Oregon State Agricultural College engineers and soil erosion students conducted an extensive field trip to the University of Idaho at Moscow, for the purpose of seeing and studying erosion project developments of this vicinity. This group was entertained at a dinner meeting on the Idaho campus as guests of the State College of Washington and University of Idaho ASAE Student Branches. The meeting was held the evening of March 22, the first of its kind ever to be held in this part of the country. Ninety-five students and faculty members were present, which offered a wonderful opportunity for the three groups to become better acquainted and to exchange comments concerning their vocational studies at their respective institutions.

Immediately following the dinner, Ivan C. Crawford, dean of the college of engineering, University of Idaho, contributed an interesting talk concerning the history of engineering and its present relationship to agriculture. Another very educational and interesting talk was given by H. J. Dana, assistant director of the engineering experiment station, State College of Washington. He spoke concerning his work with the Grand Coulee Project, and illustrated his talk by means of lantern slides of scenes photographed at the great damsite. Other entertainment features were presented by the Washington and Idaho student groups, after which the newly chartered State College of Washington Branch was welcomed into the group ASAE student branches.

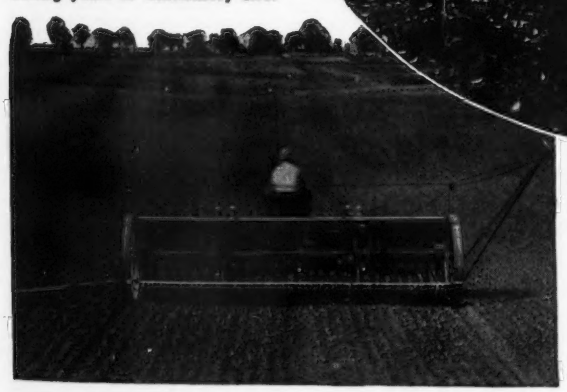
Before leaving the Idaho campus, the visitors inspected the departmental equipment and engineering classrooms. The Idaho Branch was very much pleased to have had the opportunity to entertain these fellows and desire to make such an occasion an annual affair.



Members of Oregon, Washington, and Idaho Student Branches of ASAE visit soil erosion control project (left) and gather around the festive board (right) at the University of Idaho at Moscow

Toughen Your Tillage Tools with NICKEL

● Materials that answered the purpose in the horse era are incapable of surviving the increased shocks, pressures and stresses of tractor power operation. In seeking materials that *will*, leading manufacturers are turning to the alloys containing Nickel. The superior toughness and wear-resistance of Nickel Alloy Steels and Nickel Cast Irons more than pay for the slightly higher cost by adding years to machinery life.

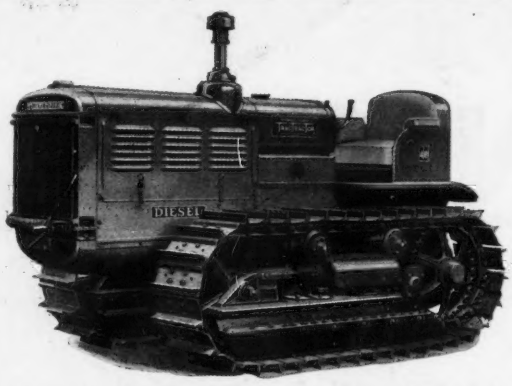


Modern materials—such as Nickel Alloy Steels and Nickel Cast Irons—make it possible to design equipment that is more ingenious, more adaptable. Thanks to the high resistance to stress, impact, shock and wear imparted by Nickel, the limitations of ordinary steels and irons are readily overcome.

Nickel Alloy Steels are widely used in agricultural equipment of every kind. They are used for bevel and transmission gears, connecting rods and bolts, forks, teeth, chain drives, crankshafts and dozens of other parts. Hard, wear-resisting Nickel Cast Irons are also extensively used for cylinder blocks, liners, engine heads, drums, etc. You may feel free to consult our engineers at any time regarding your problems.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET, NEW YORK, N. Y.



McCORMICK-DEERING
DIESEL
TRACTRACTOR

The McCormick-Deering TD-40 is a powerful, compact, Diesel-powered crawler tractor offering exceptional economy and accessibility. It is particularly well suited for work in terracing and other soil-erosion-control work. Complete details will be supplied on request.

INTERNATIONAL HARVESTER COMPANY
OF AMERICA
606 So. MICHIGAN AVE. (Inc.) CHICAGO, ILLINOIS

the BADGE
of him who
BELONGS

DESPITE the *presumption* it sets up, mere membership in the American Society of Agricultural Engineers is no *proof* of a man's high rank in technical talent. It does prove that he has met certain minimum requirements and has earned the esteem of colleagues who sponsored his application for membership.

But the Society emblem is *evidence* that native talent, be it great or small, is enriched by fraternity with the personalities whose minds fuse to form the pattern of progress in the methods and mechanics of agriculture. The wearer of the emblem waits not for the debut of an idea, but is present at its birth and helps to guide its growth.

Be you novice or veteran, your membership in the organized profession adds something to your efficiency, your vision, your influence as an individual engineer. The Society symbol on your lapel is token that you "belong." Wear it.

ASAE

Theo. Brown Awarded McCormick Medal

(Continued from page 195)

work out themslves. In this way they have had the satisfaction of taking out many patents in their own names."

The same friendly spirit has appeared in his encouragement to the younger members of the ASAE since he became a member in 1920. Among the many Society activities he has shared are chairmanships of committees on tractor drawbar machinery, general tractor-drawn machinery, horse-drawn field machinery, and standards. He has served almost continuously on these and other committees, as vice-president of the Society, and as a member of its Council. His papers and discussions before technical meetings have been noted for their penetrating clearness and brevity. His sound judgment in Society policy has contributed much to its progress and prestige.

EMPLOYMENT BULLETIN

An employment service is conducted by the American Society of Agricultural Engineers for the special benefit of its members. Only society members in good standing are privileged to insert notices in the "Men Available" section of this bulletin, and to apply for positions advertised in the "Positions Open" section. Non-members as well as members, seeking men to fill positions, for which members of the Society would be logical candidates, are privileged to insert notices in the "Positions Open" section and to be referred to persons listed in the "Men Available" section. Notices in both the "Men Available" and "Positions Open" sections will be inserted for one month only and will thereafter be discontinued, unless additional insertions are requested.

POSITIONS OPEN

RESEARCH FELLOW in the field of farm structures wanted. Research work involved will be related in some definite way to the use of ceramic materials in the construction of farm buildings. The holder may take a full graduate program of work leading toward an advanced degree. Candidates must be graduates from a standard agricultural engineering curricula and, unless waived, must be in the upper one-fourth of their classes in scholarship. The stipend is $450 for nine months. PO-103

RESEARCH FELLOW in the field of mechanical farm equipment wanted. The conditions and stipend are the same as above (PO-103), except that the research work will be related to mechanical farm equipment. PO-104

INSTRUCTOR IN AGRICULTURAL ENGINEERING. Instructorship is in the field of mechanical farm equipment, but the holder will be expected to assist with shop instruction. A candidate looking forward to making educational work a life career will be given special consideration. Some graduate study will be permitted. The salary will be $1200 to $1500 for nine months. PO-105

AGRICULTURAL ENGINEERS competent to assume responsibility for gully control work, terracing, or other engineering work which may be necessary on sub-projects, are wanted on one of the Soil Erosion Service projects. Mature men are desired who are capable of supervising the work of camp engineers and also of younger engineers employed on the job. PO-106.

PUBLISHER'S STATEMENT OF CIRCULATION

This is to certify that the average circulation per issue of AGRICULTURAL ENGINEERING for the six months' period, July 1 to and including December 31, 1934, was as follows:

Copies sold.....1274
Copies distributed free..... 39

Total.....1313

American Society of Agricultural Engineers
(Signed) Raymond Olney, Secretary

Subscribed and sworn to before me, a Notary Public of the State of Michigan, County of Berrien, on this 3d day of May,
(Signed) Hazel Bradford Smiley
My commission expires October 3, 1935.